AIR FORCE

QUALIFICATION TRAINING PACKAGE

(AFQTP)

for

STRUCTURAL

(3E3X1)

MODULE 13

PROJECT PLANNING

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MODULE 13

PROJECT PLANNING

Career Field Education and Training Plan (CFETP) references from 1 Apr 97 version.

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AIR FORCE QUALIFICATION TRAINING PACKAGES
for
STRUCTURAL
(3E3X1)

INTRODUCTION

Before starting this AFQTP, refer to and read the "Trainee/Trainer Guide" located on the AFCESA Web site **http://www.afcesa.af.mil/**

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:
AFQTP completion
Hands-on certification

Diamond task:
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location.*

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOT revised this AFQTP. If you have any recommendations for improving this document, please contact the Structures Career Field Manager at the address below.

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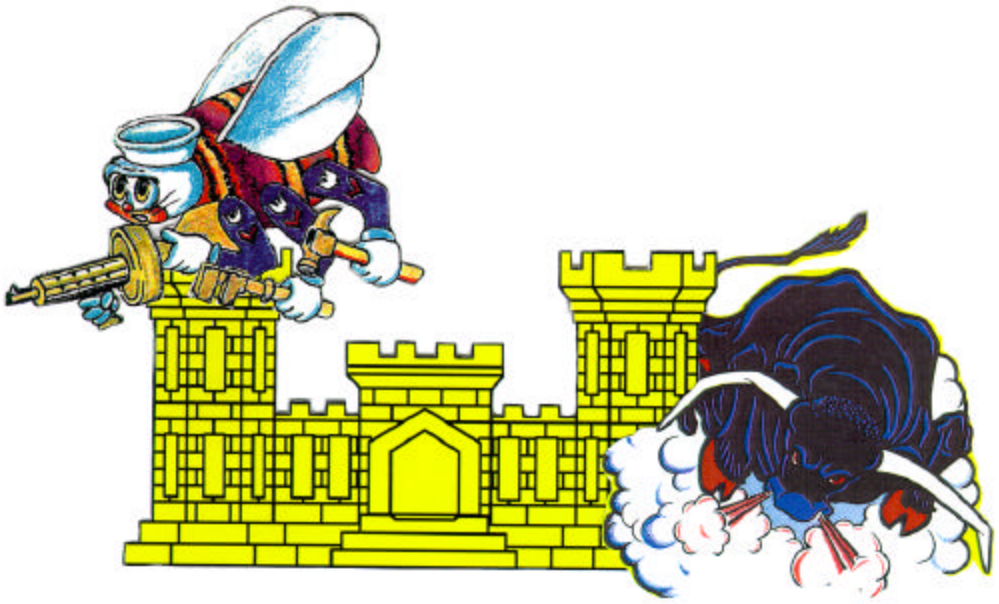
Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.



USE CONSTRUCTION DRAWINGS FOR:

MODULE 13 AFQTP UNIT 2

CARPENTRY (13.2.1.)

CARPENTRY

Task Training Guide

STS Reference Number/Title:	13.2.1. Carpentry
Training References:	• TM 5-581B; NAVEDTRA 12520, 12521, Builders 3 and 2; NAVEDTRA 10563-G, Steelworker 3 and 2; Welding Skills, Modern Carpentry, by R.T. Miller, and Modern Masonry by Clois E. Kicklighter
Prerequisites:	• Possess as a minimum, a 3E351 AFSC
Equipment/Tools Required:	• Complete set of construction drawings
Learning Objective:	• Trainee will be able to interpret carpentry construction drawings, have good working knowledge of all basic drawings, symbols, details, and specifications.
Samples of Behavior:	• Trainee will demonstrate a basic knowledge of different types of construction drawings, various symbols, details, and be able to interpret blueprints.

CARPENTRY

Background: Construction drawings, commonly known as blueprints, are essential parts of the planning process before beginning any major renovation or new construction project. They provide a complete graphic description of all phases of the construction process. Craftsmen must have a good general knowledge of the different types of construction drawings, symbols, and ultimately how to translate that information into a finished product. First, we'll cover the various elements of construction drawings.

Types of Construction Drawings. Construction drawings show the proposed structure from different perspectives. They may include, but are not limited to, site plans, plot plans, foundation plans, floor plans, and elevation plans. For the purpose of this AFQTP, we will concentrate on the carpentry related plans and drawings. The type of drawing is annotated in the title block located on the bottom right corner of the drawing.

- **Site Plan.** Shows boundaries, existing utilities, landmarks, and the location of the proposed structure.

- **Plot Plan.** Shows survey marks, elevations, and grading requirements.

- **Foundation Plan:** Shows how foundation is to be constructed (See Figure 1, Foundation Plan).

- **Floor Plan.** View as seen from above. This is a key drawing from which the building's walls are laid out. Provides building dimensions, utility placements, interior wall, window, and door locations (See Figure 3, Floor Plan).

- **Elevation View.** View as seen from the front, rear, or sides. Elevations show the finished structure as viewed from various side views (See Figure 4, Elevation View).

- **Framing Plan.** Viewed from the top. Shows framing and gives dimensions and exact placement of structural framing members.

- **Roof Framing Plan.** Shows the exact position and spacing of structural members for the roof, as viewed from above. In contrast, the roof plan outlines major elements of the roof such as ridges, valleys, hips, dormers, skylights, and chimneys. In this view, the roof frame is not exposed.

- **Specifications.** Specifications supplement construction drawings. They explain:
    1. How the work is to be accomplished.
    2. Specific qualities of the materials to be used.
    3. Procedures for doing the work or tasks.

NOTE:
If the construction drawing and the specifications conflict, the specifications take precedence.

- **Detail Drawings.** Shows special features of construction that are normally too small to be seen on other drawings.

- **Notes.** Give additional information or instructions on the drawing.

- **Schedules.** The four most common schedules are material schedules, door and window schedules, and finish schedules**.** (See Figure 3, Floor Plan)

    a. Material schedules. These schedules list what materials are to be used on floors, walls, and ceilings by room.

    b. Door and Window schedules. These schedules provide sizes, types, composition, and manufacturer of the doors and windows. They are cross-referenced to the floor plan.

    c. Finish schedules. These schedules detail the interior and exterior finish of the structure.

- **Common Building Material Symbols include:**

    - Brick
    - Glass
    - Concrete block
    - Metal
    - Earth
    - Stone
    - Wood
    - Concrete

- **Door and Window Symbols include:**

    - **Doors:** On elevation drawings, doors are shown as a realistic representation. They are normally indexed to a door schedule (See Figure 4, Elevation View).

    - **Windows:** On elevation drawings, windows are also shown as a realistic representation. They too are normally indexed to a window schedule (See Figure 4, Elevation View).

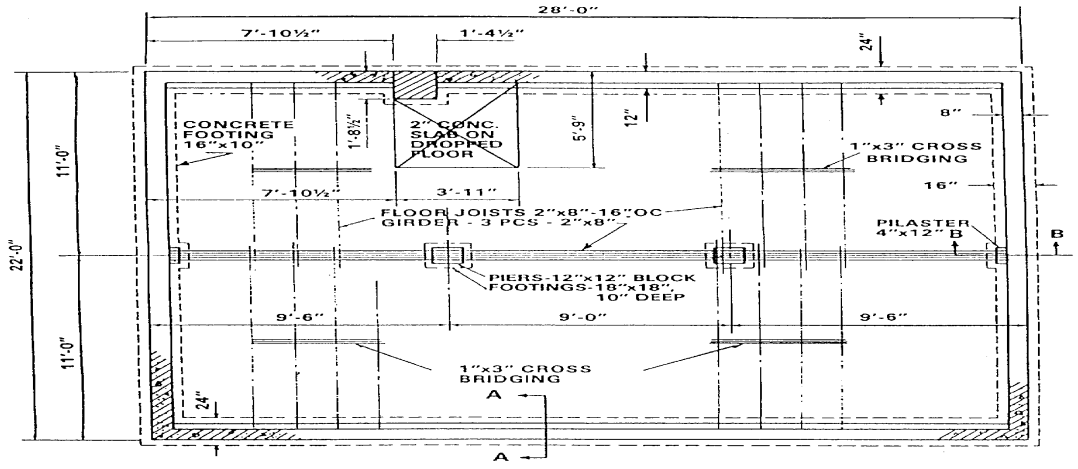


Figure 1, Foundation Plan

Reference Symbols include:

- A combination of letters **and** numbers within a circle
- Letters **or** numbers within a circle
- Used to cross reference specific doors or windows on the elevation or floor plans with the door and window schedule (See Figure 2, Reference Symbols)

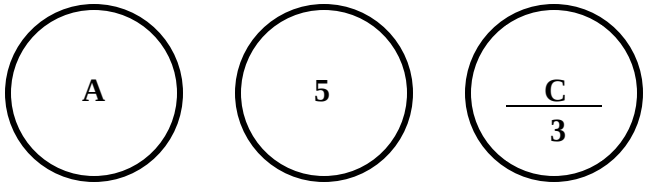


Figure 2, Reference Symbols

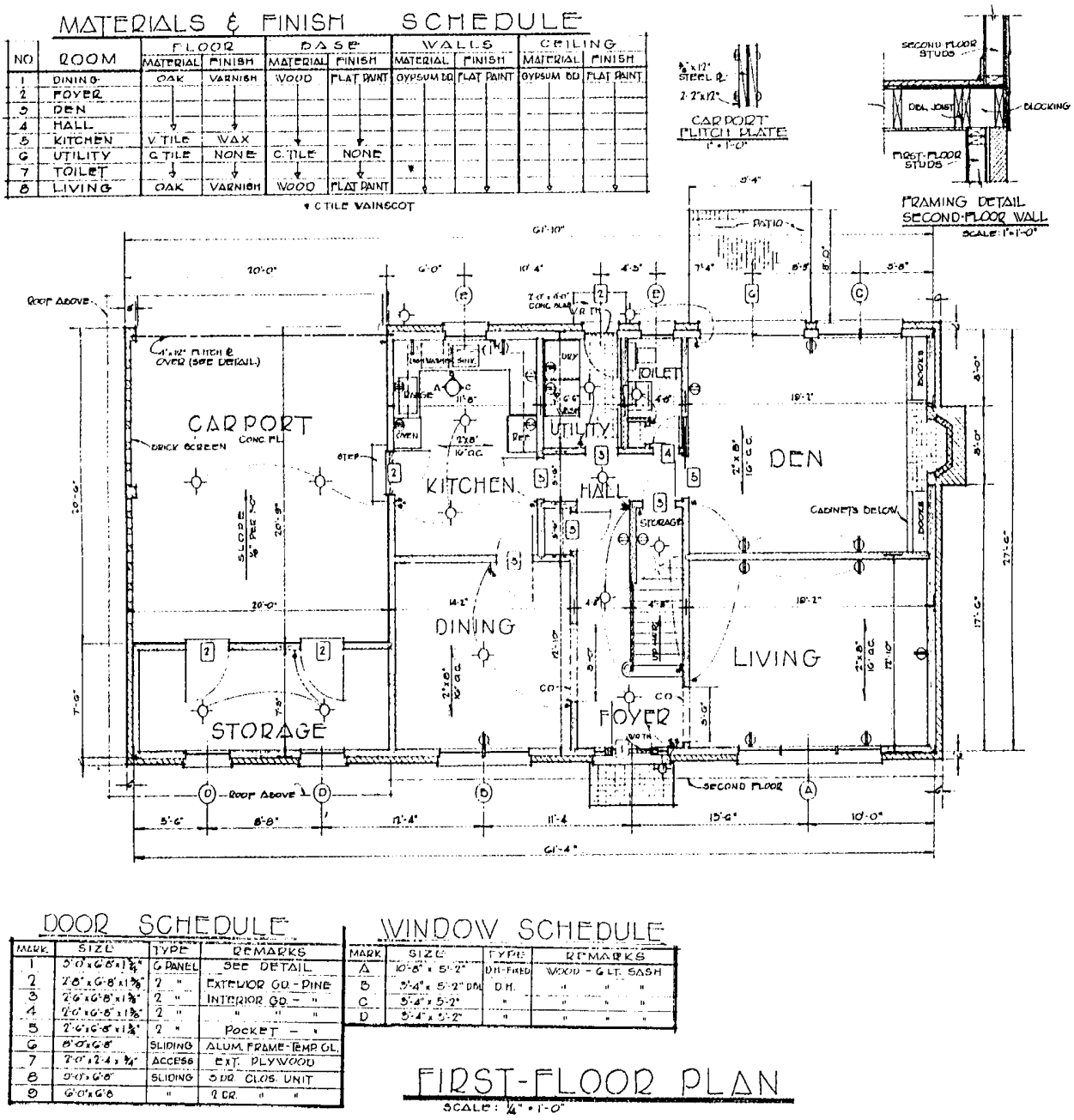


Figure 3, Floor Plan

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

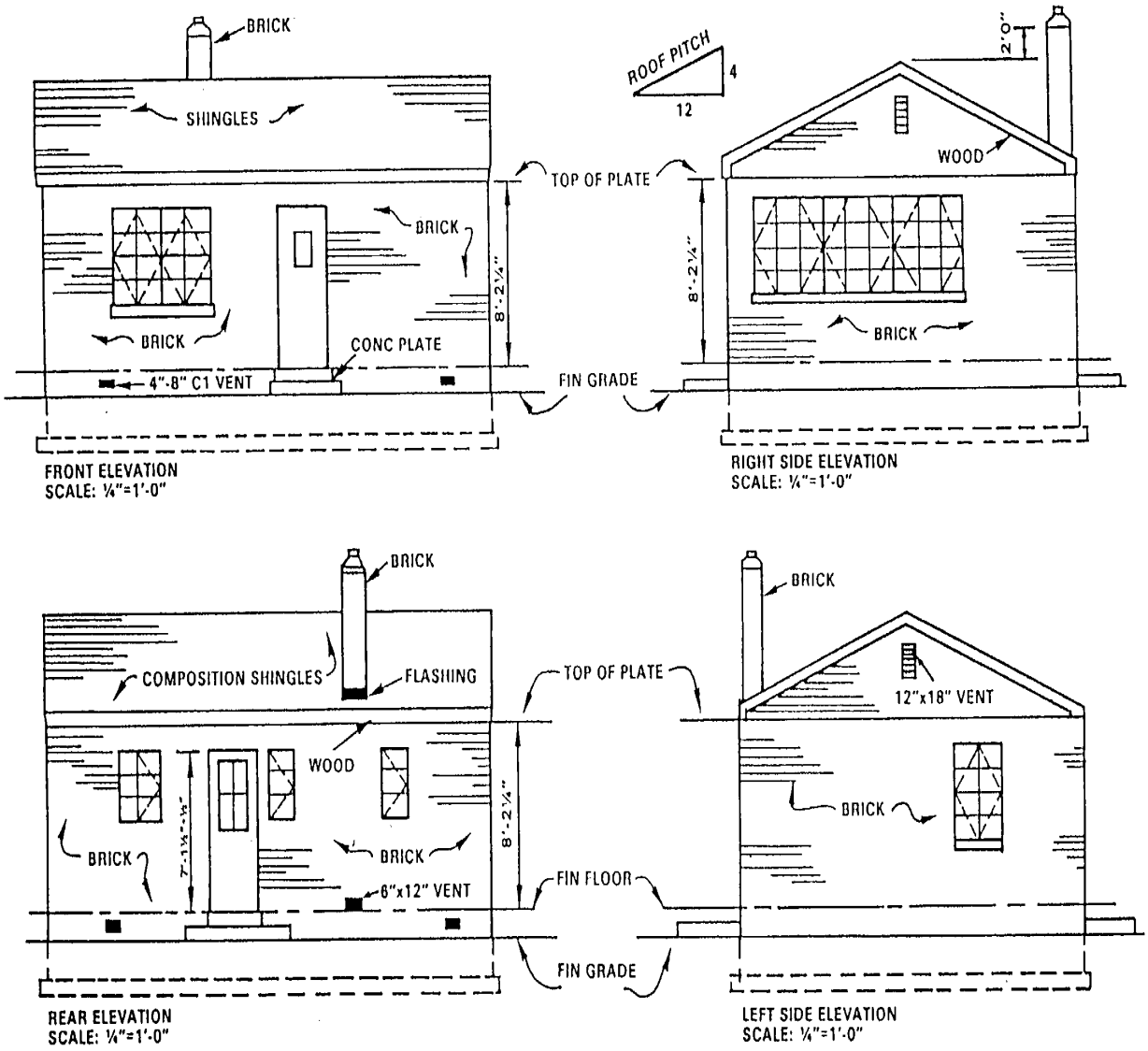


Figure 4, Elevation View

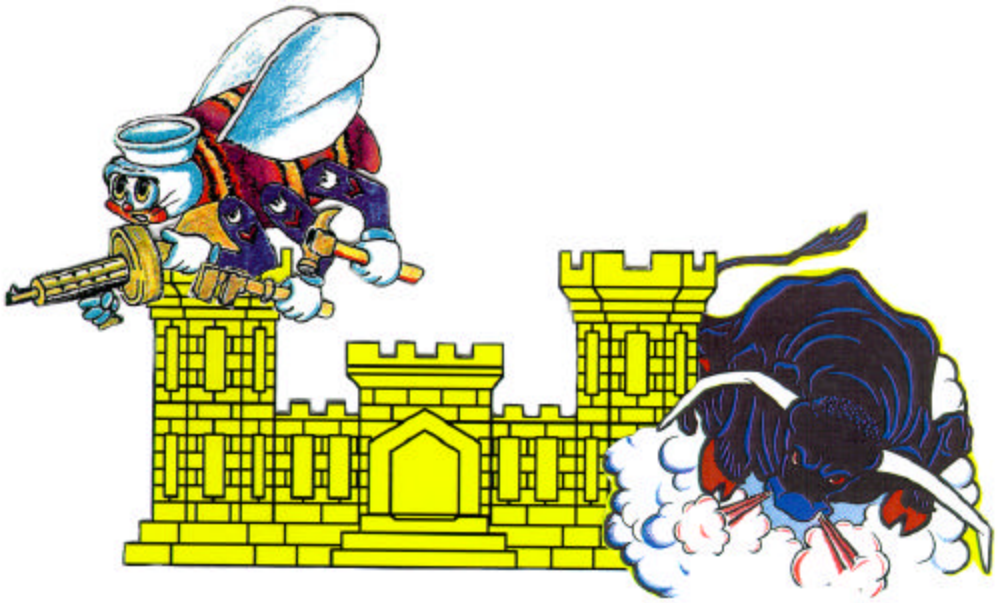
Review Questions
for
Carpentry

Question	Answer
1. Which plan shows boundaries, existing utilities, landmarks, and the location of the proposed structure?	a. Floor plan b. Elevation plan c. Plot plan d. Site plan
2. Which plan is the primary plan from which the interior walls are laid out?	a. Floor plan b. Elevation plan c. Plot plan d. Site plan
3. Specifications provide _____.	a. How the work is to be accomplished b. Specific qualities of the materials to be used c. Procedures for doing the work or tasks d. All of the above
4. Schedules provide _____.	a. Specifications on how to build walls b. Details on how to tie columns to the slab c. Listing of doors and windows to be used d. None of the above
5. Detail drawings show construction features too small to see on other drawings.	a. True b. False
6. If specifications and construction drawings conflict _____.	a. Construction drawings take precedence b. Specifications take precedence c. Ignore the discrepancy d. Specifications and construction drawings never conflict

CARPENTRY

Performance Checklist		
Step	**Yes**	**No**
1. Did trainee correctly identify site plan?		
2. Did the trainee correctly identify the plot plan?		
3. Did the trainee correctly identify the floor plan and elevation plan?		
4. Given a simple floor plan, can trainee accurately lay out interior walls?		
5. Using the same plans, can the trainee lay out windows and doors in exterior walls?		
6. Did the trainee find the roof pitch in the drawing?		
7. Can trainee cross- reference symbols on drawings to schedules?		
8. Can the trainee identify the most common building symbols?		
9. If trainee cannot recognize a particular symbol, can trainee find the information in publications?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



USE CONSTRUCTION DRAWINGS FOR:

MODULE 13 **AFQTP UNIT 2**

MASONRY (13.2.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

MASONRY

Task Training Guide

STS Reference Number/Title:	13.2.2. Masonry
Training References:	• TM 5-581B; NAVEDTRA 12520, 12521, Builders 3 and 2; NAVEDTRA 10563-G, Steelworker 3 and 2; Modern Carpentry, by R.T. Miller, and Modern Masonry, by Clois E. Kicklighter
Prerequisites:	• Possess as a minimum, a 3E351 AFSC
Equipment/Tools Required:	• Complete set of construction drawings
Learning Objective:	• Trainee will be able to interpret masonry construction drawings, have good working knowledge of all basic drawings, symbols, details, and specifications.
Samples of Behavior:	• Trainee will demonstrate a basic knowledge of different types of construction drawings, various symbols, details, and be able to interpret blueprints.

MASONRY

Background: One of the most fundamental features of any structure is the foundation. A properly designed and built foundation will keep settling to an absolute minimum. The primary drawing in starting construction is the foundation plan. Foundation plans are typically shown in the plan (top) view. They illustrate the overall dimensions, footers, stem walls, columns and or piers to be included in the building foundation. They are normally supplemented by sectional (side cut away) views. These sectional views further illustrate such things as joints, key ways, and steel reinforcement.

Two of the most common foundations are the **matt foundation** and the **raft foundation**.

The **Matt Foundation** (Figure 1). This type foundation consists of a poured slab with thickened outer edges that connect with the footings.

Raft Foundation (Figure 2). This foundation is basically an inverted **matt foundation**. There are no footers; the slab equally distributes the weight of the structure. The stem walls along the perimeter of the raft are poured at the same time as the slab.

Both foundations may be poured as entire units; this is commonly known as a monolithic pour. Resting on the slab, footer, or stem wall will be the concrete block, brick, metal or wooden frame. They are connected to the foundation by various means, which are detailed in the foundation details. Depending on the complexity of the project, numerous detail drawings will show how brick or stone veneer tie into the wall, anchoring requirements, bond beams, etc.
Details will specify the laying patterns for concrete masonry units, (CMU) block, brick, or structural clay tile.

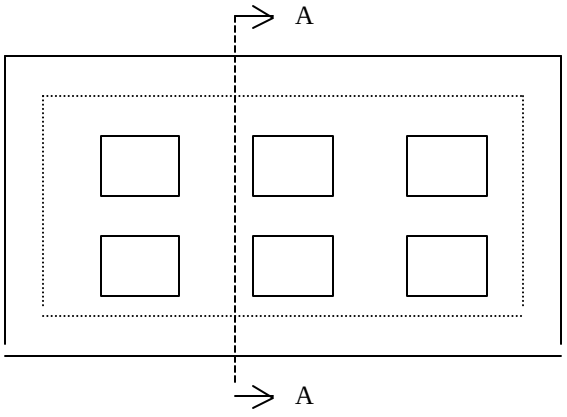


Figure 1, Matt Foundation

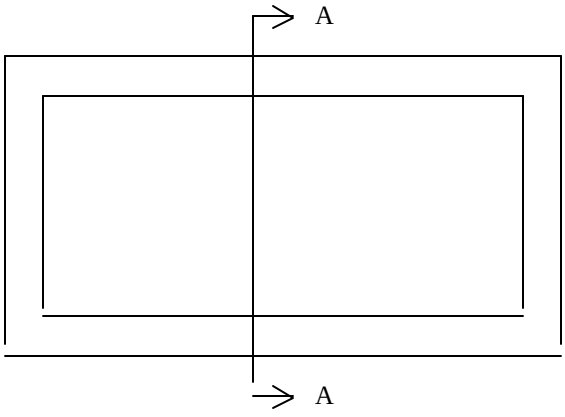


Figure 2, Raft Foundation

- **Types of Construction Drawings.** Construction drawings show the proposed structure from different perspectives. They may include, but are not limited to, site plans, plot plans, foundation plans, floor plans, and elevation plans. For the purpose of this AFQTP, we will concentrate on the carpentry related plans and drawings. The type of drawing is annotated in the title block, which is normally located on the bottom right corner of the drawing.

NOTE:
Refer to the previous AFQTP 13.2.1., for examples of some of the following construction drawings.

- **Site Plan.** Shows boundaries, existing utilities, landmarks, and the location of the proposed structure.

- **Plot Plan.** Shows survey marks, elevations, and grading requirements.

- **Foundation Plan.** Shows how the foundation is to be constructed.

- **Floor Plan.** View as seen from above. This is a key drawing from which the building's walls are laid out. Provides building dimensions, utility placements, interior wall, window, and door locations.

- **Elevation View.** View as seen from the front, rear, or sides. Elevations show the finished structure as viewed from various side views.

- **Specifications.** Specifications supplement construction drawings. They explain:
    1. How the work is to be accomplished.
    2. Specific qualities of the materials to be used.
    3. Procedures for doing the work or tasks.

NOTE:
If the construction drawing and the specifications conflict, the specifications take precedence.

- **Detail Drawings.** Show special features of construction that are normally too small to be seen on other drawings.

- **Notes.** Give additional information or instructions on the drawing.

- **Schedules.** The four most common schedules are material schedules, door and window schedules, and finish schedules**.**

    a. **Material schedules:** List by room what materials are to be used on floors, walls, and ceilings.

    b. **Door and Window schedules:** Provide sizes, types, composition, and manufacturer of the doors and windows. They are cross-referenced to the floor plan.

    c. Finish schedules: Detail the interior and exterior finish of the structure

- **Common Building Material Symbols include:**

    - Brick
    - Glass
    - Concrete block
    - Metal
    - Earth
    - Wood
    - Stone
    - Concrete

- **Door and Window Symbols include:**

    - **Doors:** On elevation drawings, doors are shown as a realistic representation. They are normally indexed to a door schedule.

    - **Windows:** On elevation drawings, windows are also shown as a realistic representation. They too are normally indexed to a window schedule.

- **Reference Symbols include:**

    - Combination of letters **and** numbers within a circle

    - Letters **or** numbers within a circle. Used to cross reference specific doors or windows on the elevation or floor plans with the door and window schedule.

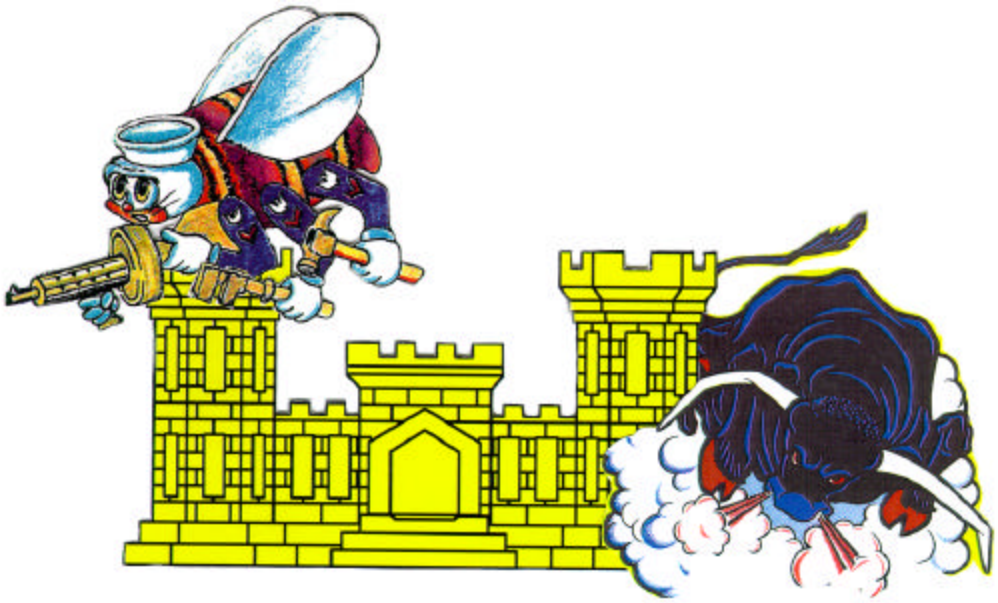
Review Questions
for
Masonry

Question	Answer
1. Which plan is the primary plan from which the footers are laid out?	a. Floor plan b. Elevation plan c. Foundation plan d. Site plan
2. Which plan is the primary plan from which the concrete block walls are laid out?	a. Floor plan b. Elevation plan c. Plot plan d. Site plan
3. Specifications provide _____.	a. What size mortar joint is required b. Type of brick to be used c. Type of mortar to be used d. All of the above
4. Schedules provide _____.	a. Specifications on how to build walls b. Details on how to tie columns to the slab c. Listing of doors and windows to be used d. None of the above
5. Detail drawings show _____.	a. Control joint spacing b. Steel reinforcement placement in concrete block cores c. Rough openings for doors d. Quarry tile size requirements
6. Where would you find information on what strength concrete to fill the bond beam with?	a. Foundation plan b. Specifications c. Details d. Schedules

MASONRY

Performance Checklist		
Step	**Yes**	**No**
1. Can the trainee correctly identify the two most common foundations? (matt and raft foundation)		
2. If trainee cannot recognize a particular symbol, can trainee find the information in publications?		
3. Can trainee cross- reference symbols on drawings to schedules?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



USE CONSTRUCTION DRAWINGS FOR:

MODULE 13 AFQTP UNIT 2

METAL (13.2.3.)

METAL

Task Training Guide

STS Reference Number/Title:	13.2.3. Metal
Training References:	• 3E351 CDCs • Modern Metalworking by John R. Walker • Welding Skills by R.T. Miller
Prerequisites:	• Possess as a minimum, a 3E351 AFSC
Equipment/Tools Required:	• N/A
Learning Objective:	• Trainee should read and understand blueprints and use them to do a task.
Samples of Behavior:	• Trainee will have the basic knowledge of the different types of drawings and understand the different types of symbols.

METAL

Background: Construction drawings, commonly known as blueprints, are an essential part of the planning process before beginning any major project. They provide a complete description of all phases of the construction process. There are numerous symbols used in the metals field ranging from welding to ductwork. The specific job related symbols would be listed on the construction drawing. Also, on the drawings there will be a list of all the materials needed for the job. When using construction drawings, plan very carefully not to waste time on the project. In this AFQTP we will cover the installation of a duct system as well as discuss some common welding symbols.

HINT:
Always check your blueprints after each step to assure they are within specifications.

To perform this task, follow these steps:

Step 1: Check the blueprints for specifications, to see what size ductwork needs to be installed, hung, and where the diffusers should be.

Step 2: After determining the duct size, check all materials for availability. Layout the ductwork starting with the main trunk line and work towards the branch lines. Install and insulate ductwork.

Step 3: Check the blueprints for installation of main trunk line. From that point, establish the centerline and start hanging ductwork.

Step 4: After the main trunk line is in place, hang the branch lines and install diffusers. Ensure the branch lines and diffusers measurements agree with the blueprints.

Step 5: After all ductwork is installed, install return air vents. Follow the blueprints; they illustrate the size and place for the vents.

HINT:
Make sure that you refer back to your drawings if there are any questions about the installation of the duct.

Figures 1 and 2 on the following pages show some of the common symbols associated with different types of ductwork.

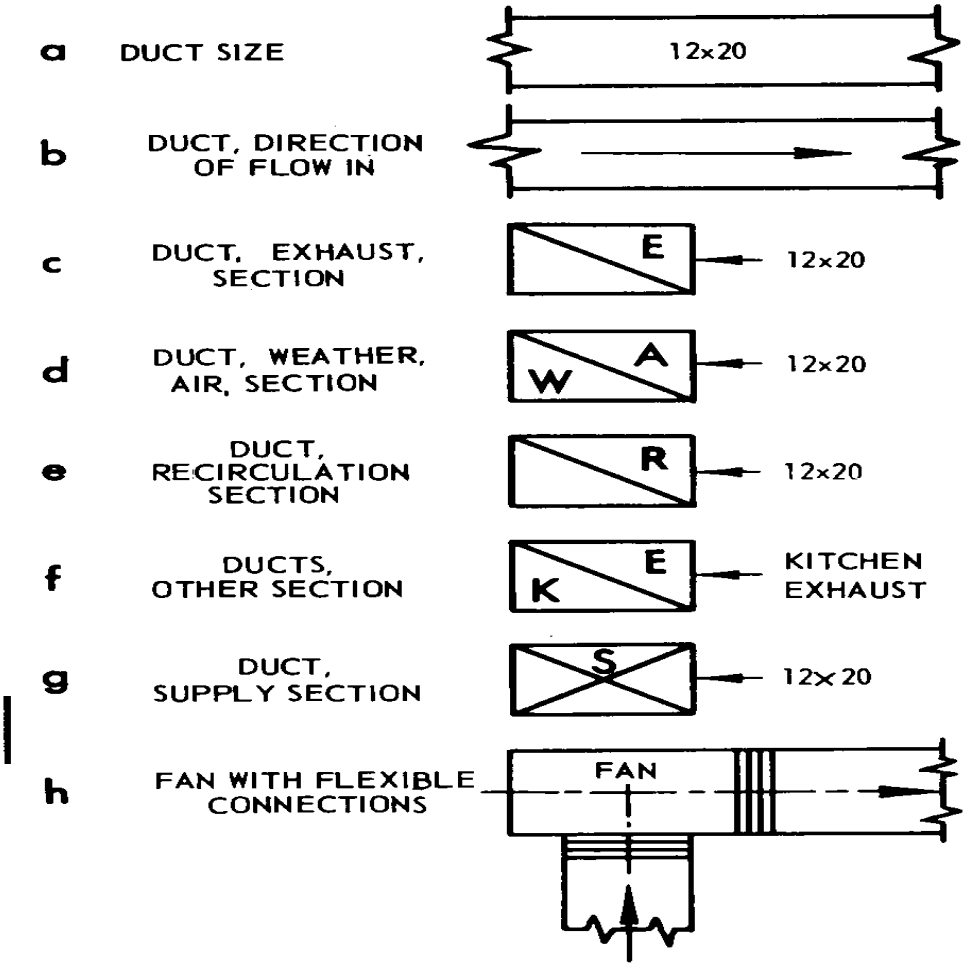


Figure 1, Types of Ductwork

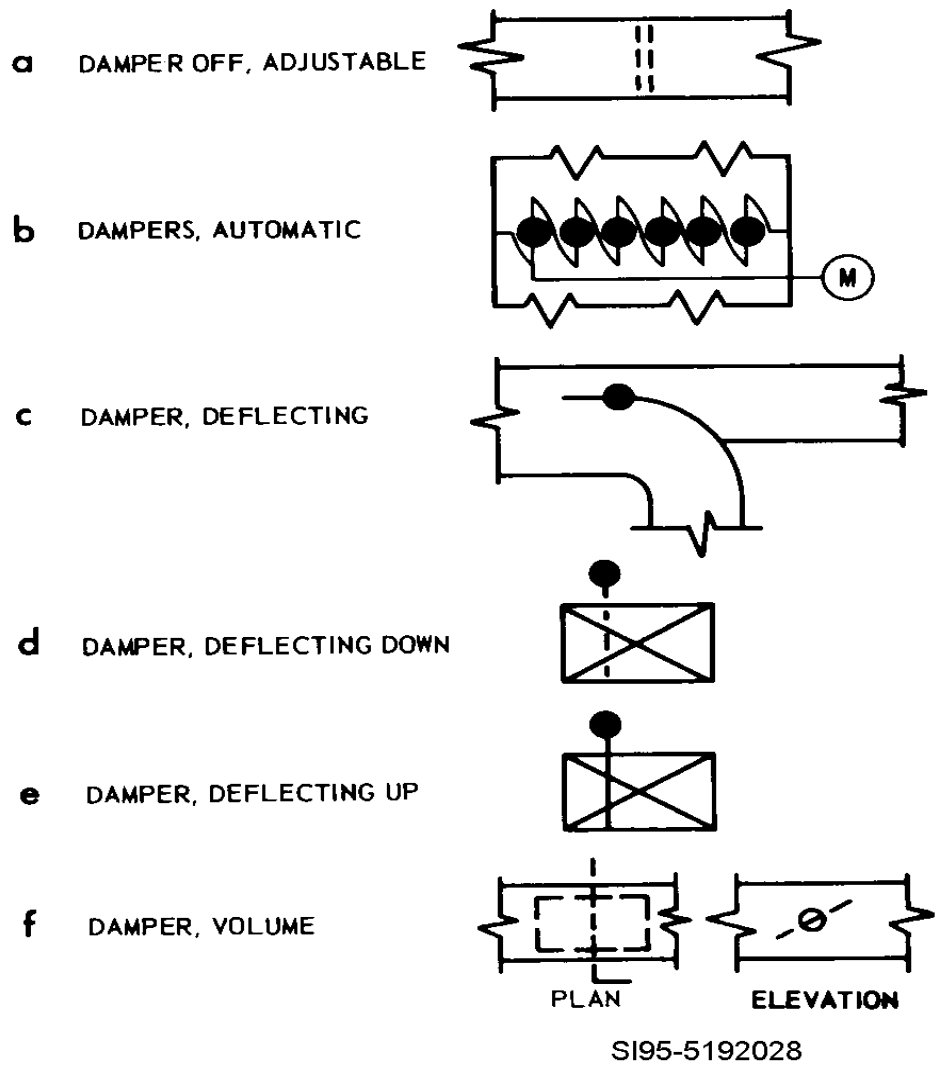


Figure 2, Types of Ductwork

Welding. Following the drawings for welding is more in-depth than the installation of ductwork. You must have a good understanding of all welding symbols and their meanings. To start the welding portion of the job, consult the blueprints very carefully for welding requirements needed. Figure 3 below shows some of the most commonly used welding symbols.

HINT:
There may be a need for some pre-welding performed in the shop before starting the job. Read the blueprints very carefully.

Check the material list for availability of required materials. Set the welding machine for job specifications, and start welding.

NOTE:
Each welding symbol is different and should be looked at very carefully in order to get the right weld.

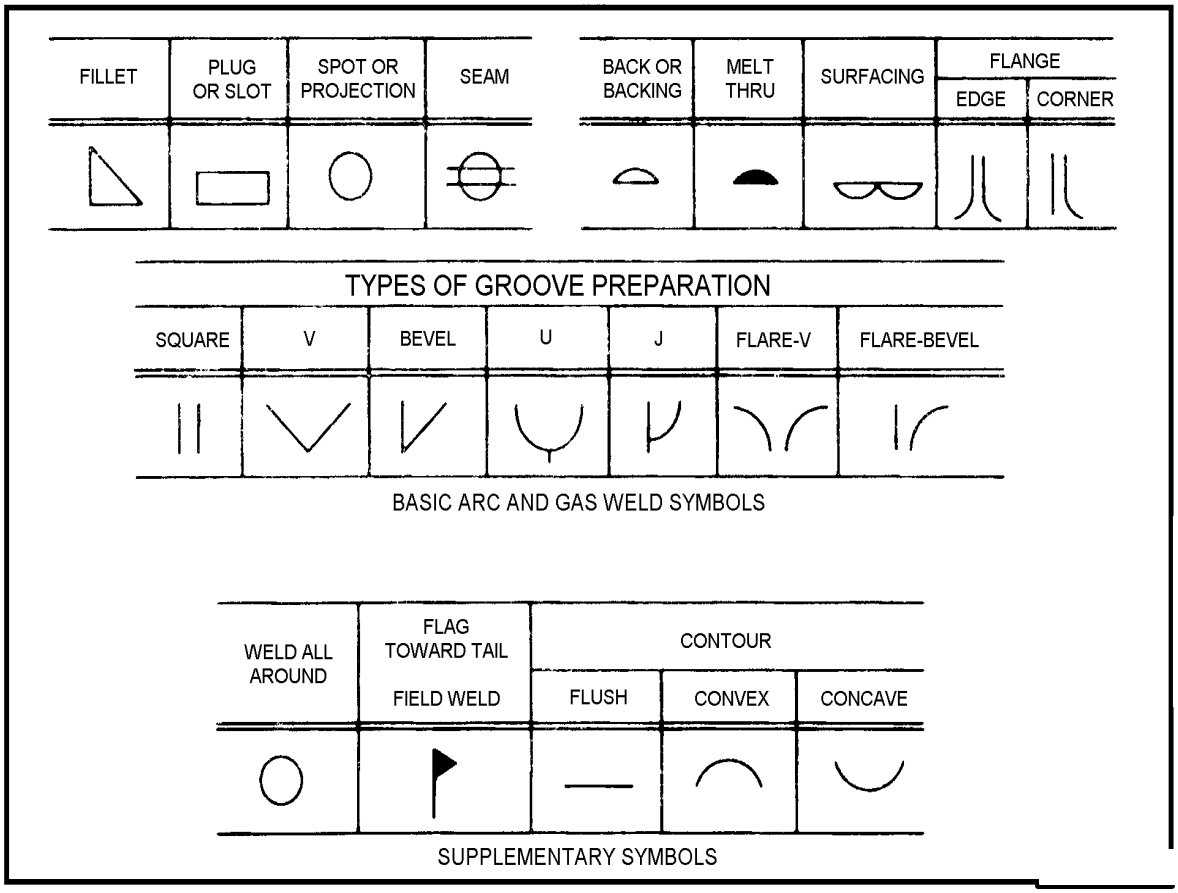
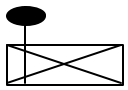


Figure 3, Most Commonly used Welding Symbols

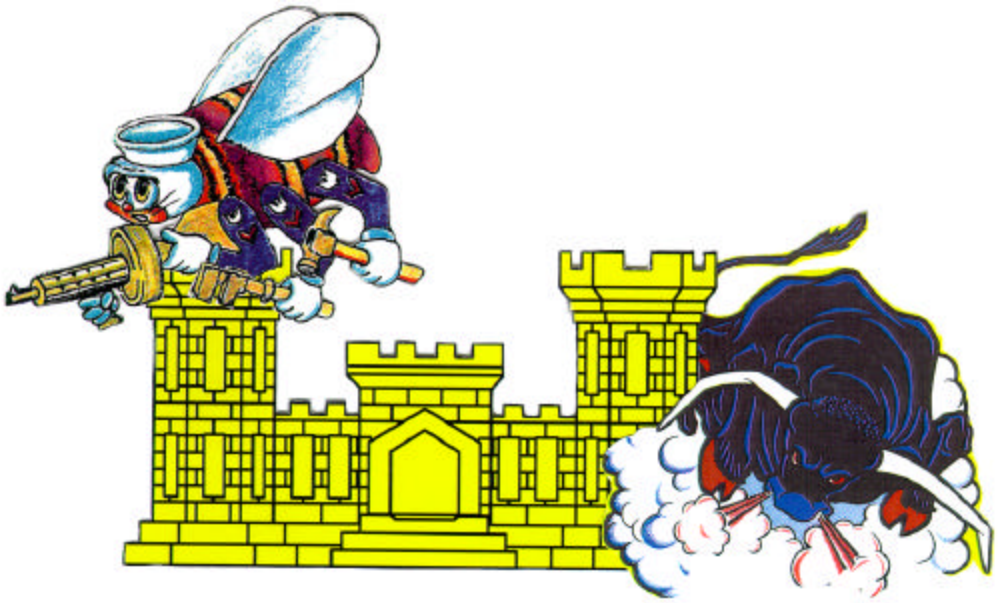
Review Questions
for
Metal

Question	Answer
1. Construction drawings provide a complete description of all phases of the construction process.	a. True b. False
 2. This is the symbol for _____.	a. Damper deflecting down b. Plug or Slot c. Fillet d. Damper deflecting up
3. It is not necessary to consult the construction drawings while performing a metals job.	a. True b. False
4. After all ductwork is installed, install _____.	a. re-circulation ducts b. return air vents c. exhaust ducts

METAL

Performance Checklist		
Step	**Yes**	**No**
1. Was the trainee able to identify all the symbols that deal with ductwork and welding?		
2. Did the trainee refer back to the blueprints each time he/she had a question?		
3. Did the trainee use the note section of the blueprints?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



IDENTIFY TYPE OF MATERIAL REQUIRED FOR:

MODULE 13 AFQTP UNIT 3

CARPENTRY (13.3.1.)

CARPENTRY

Task Training Guide

STS Reference Number/Title:	13.3.1. Carpentry
Training References:	• Modern Carpentry by R.T. Miller, Vol. 1 & 2, Materials of Construction, Third Edition • NAVEDTRA 12520, 12521, Builders 3 and 2, Vol.1 &2
Prerequisites:	• Trainee should have a basic knowledge of basic building materials. • Possess as a minimum, a 3E351 AFSC
Equipment/Tools Required:	• The above named training references, if available
Learning Objective:	• Upon completion of this module trainee should be able to identify the most common building materials, and when their application is appropriate.
Samples of Behavior:	• Trainee will recognize basic building materials and their uses.
Notes:	

CARPENTRY

Background: Building materials are constantly evolving. The variety and types of building products available today is almost endless. Construction materials are still in the process of evolving. Make every effort to stay current with the latest advances as technology progresses. It is difficult to discuss this subject in the limited segment allotted to this AFQTP. Several excellent reference books are available to learn more about construction materials. For the purpose of this AFQTP, we will concentrate only on the most basic materials.

Lumber. As you probably know, lumber is purchased in nominal sizes as opposed to actual sizes. The difference is partially due to the shrinkage of the wood during the curing process and the subsequent surfacing. The most common types of structural lumber species are milled of soft woods such as white pine, yellow pine, spruce, and fir. Due to the cost, weight, and degree of difficulty to work, hard woods are rarely used as structural members. The categories of structural lumber are:

a. Structural light framing
b. Structural joists and planks
c. Appearance framing
d. Decking
e. Beams
f. Stringers
g. Posts
h. Columns

Each category is further divided into grades that are standardized by the Standard Grading Rules. They are classified according to:

a. Species
b. Use
c. Extent of manufacturing
d. Size

The extent of manufacturing refers to whether or not the lumber has been surfaced, and if so, how many sides have been dressed (planed.) See Figure 1 for lumber grades and characteristics.

SELECT LUMBER	
Grade A	This lumber is practically free of defects and blemishes
Grade B	This lumber contains a few minor blemishes
Grade C	This lumber contains more numerous and more significant blemishes than grade B. It must be capable of being easily and thoroughly concealed with paint
Grade D	This lumber contains more numerous and more significant blemishes than grade C, but it is still capable of presenting a satisfactory appearance when painted
COMMON LUMBER	
No. 1	Sound, tight-knotted stock containing only a few minor defects. Must be suitable for use as watertight lumber
No. 2	Contains a limited number of significant defects but no knotholes or other serious defects. Must be suitable for use as grain-tight lumber
No. 3	Contains a few defects that are larger and coarser than those in No. 2 common; for example, occasional knotholes
No. 4	Low-quality material containing serious defects like knotholes, checks, shakes, and decay
No. 5	Capable only of holding together under ordinary handling

Figure1, Lumber Grades and Characteristics

Plywood. Like lumber, there is a tremendous variety of different types and grades of plywood. These include interior, exterior, forming, marine, and cabinet grades. The primary differences between the classes are the grade of the outer veneers, and the type of glue used to bond the sheets together. We will concentrate on only the most common- interior and exterior grades. Figure 2 shows a typical back stamp on a sheet of plywood.

Common Interior Grades of Plywood

GRADE	CHARACTERISTICS	APPLICATIONS
A-A	Good veneer on both sides, sanded, very good quality, may have small, neat patches, paints well	Used for inexpensive cabinets
A-C	Good veneer on one side, backside has knots, knotholes, and other small defects, sanded.	Used for floor underlayment and concrete forms
B-C	Select sheathing tight face. Unsanded. A uniform surface, minor surface defect, open splits on front side; back has knots, knotholes and minor defects.	Used for sub floors. Sheathing, and concrete forms where smooth surface is not required

Exterior Grade Plywood

GRADE	CHARACTERISTICS	APPLICATIONS
A-A	Manufactured with waterproof glue. Otherwise same veneer standards as interior A-A standards.	Used when high quality waterproof plywood is required.
A-B	Manufactured with waterproof glue. Otherwise same veneer standards as interior A-B standards.	Used when very good quality waterproof plywood is required.
B-B	Manufactured with waterproof glue. Otherwise same veneer standards as interior B-B standards.	Used extensively for concrete forming.
A-C	Manufactured with waterproof glue. Otherwise same veneer standards as interior A-C standards.	Used when good quality waterproof plywood is required.
C-C	Manufactured with waterproof glue. Otherwise same veneer standards as interior C-C standards.	Used primarily for concrete forming.
CDX	Manufactured with waterproof glue. Otherwise same veneer standards as interior C-D standards.	Used primarily for wall sheathing, roof decking or when perfectly smooth surface is not required.

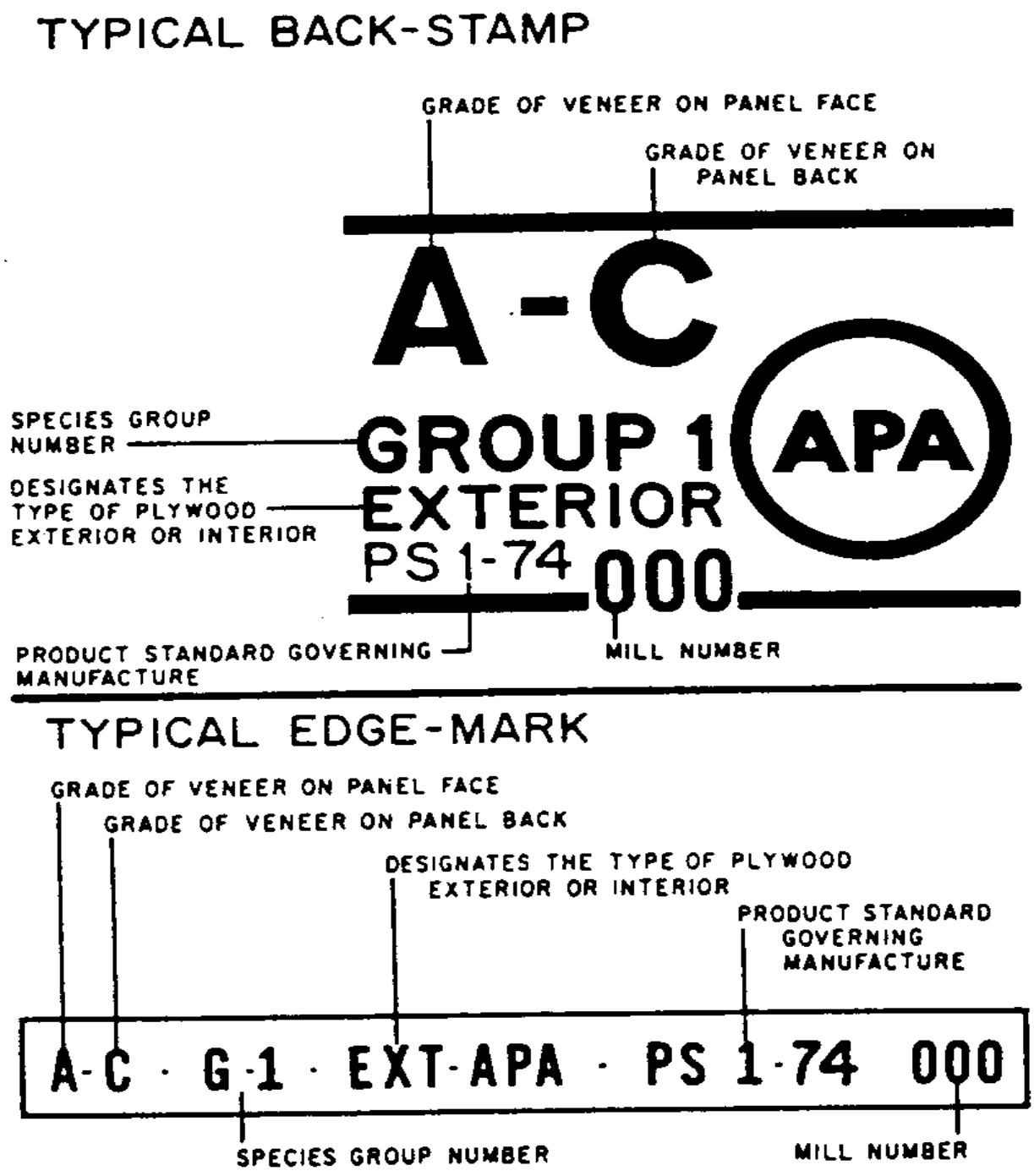


Figure 2, Typical Back-Stamp

Gypsum Wall Board. Gypsum wallboard is more commonly known as dry wall, or by its trade name, sheetrock. With the advent of dry wall, finishing walls with traditional plaster became obsolete. This was due to the ease of installation, the excellent finished surface, its fire resistance, and the savings of labor. Dry wall is available in common thickness' that range from 3/8 to 5/8 of an inch. The most commonly used sheets are 4 foot by 8 foot, and 4 foot by 12 foot. Larger thicknesses and lengths are available by special order, but are rarely used due to difficulty of handling.

Nails. Nails are classified according to their size and use. Lengths are classified as (p) for penny or (d). Sizes range from 1 inch for a 2-penny nail to a 60 penny nail which is 6 inches long. Figures 3 and 4 show common nail sizes and types.

There are many types of nails including:

- The **common nail** is used for framing.
- The **box nail** is used for light framing and toenailing.
- **Casing nails** are used for finish carpentry work such as installing doorjambs and door and window casings. They are heavier duty than the finish nail.
- **Finish nails** and **brads** are used for lightweight trim such as crown molding or chair rail.
- **Specialty nails** include annular (ring) nails, spiral nails, duplex nails, roofing nails, drywall nails, and masonry nails.

    a. **Ring nails** have superior holding power due to the extra friction the rings give.

    b. **Spiral nails** also have that extra holding power because the spiral shape is similar to a wood screw.

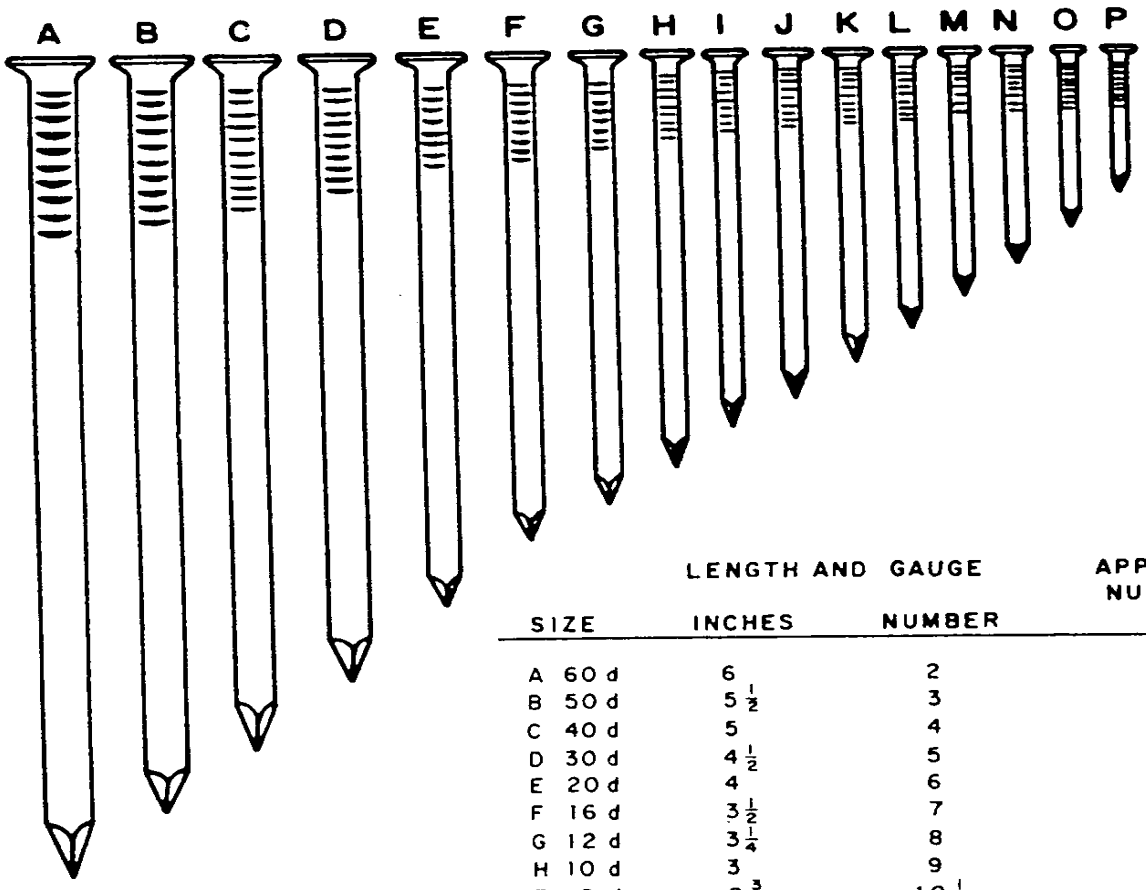
    c. **Duplex nails** are used for temporarily securing lumber together. They are used for securing forms and wall braces or other instances when the nail is not permanent.

    d. **Roofing nails** are used for securing asphalt shingles, rolled roofing, or flashing.

    e. **Drywall nails** secure drywall to structural members securely. The rings prevent the nail from pulling out easily and the head is slightly concave to prevent tearing the drywall paper.

    f. **Masonry nails** are heat treated during the manufacturing process, which gives them the exceptional strength needed to penetrate concrete.

    g. **Coated nails** have exceptional holding power. They are coated from the factory with concrete or glue.



COMMON WIRE NAILS

SIZE	LENGTH AND GAUGE INCHES	NUMBER	APPROXIMATE NUMBER TO POUND
A 60 d	6	2	11
B 50 d	5 1/2	3	14
C 40 d	5	4	18
D 30 d	4 1/2	5	24
E 20 d	4	6	31
F 16 d	3 1/2	7	49
G 12 d	3 1/4	8	63
H 10 d	3	9	69
I 9 d	2 3/4	10 1/4	96
J 8 d	2 1/2	10 1/4	106
K 7 d	2 1/4	11 1/2	161
L 6 d	2	11 1/2	181
M 5 d	1 3/4	12 1/2	271
N 4 d	1 1/2	12 1/2	316
O 3 d	1 1/4	14	568
P 2 d	1	15	876

Figure 3, Common Nail Sizes

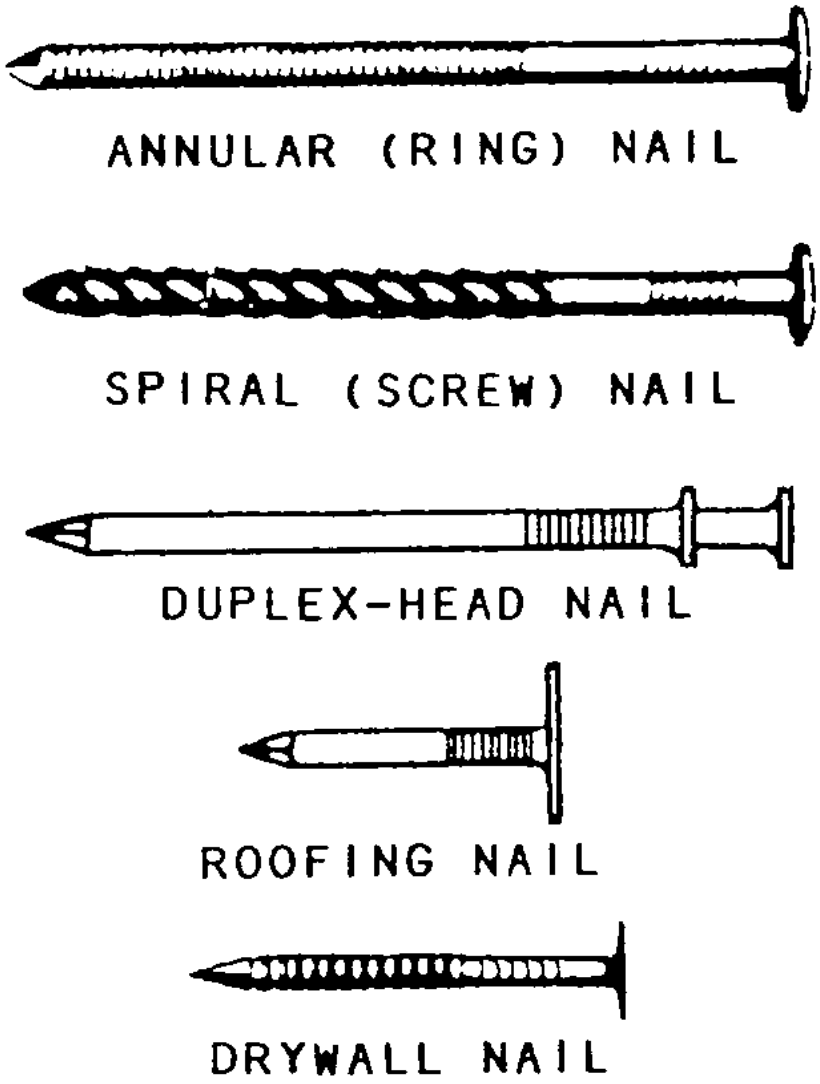


Figure 4, Types of Nails

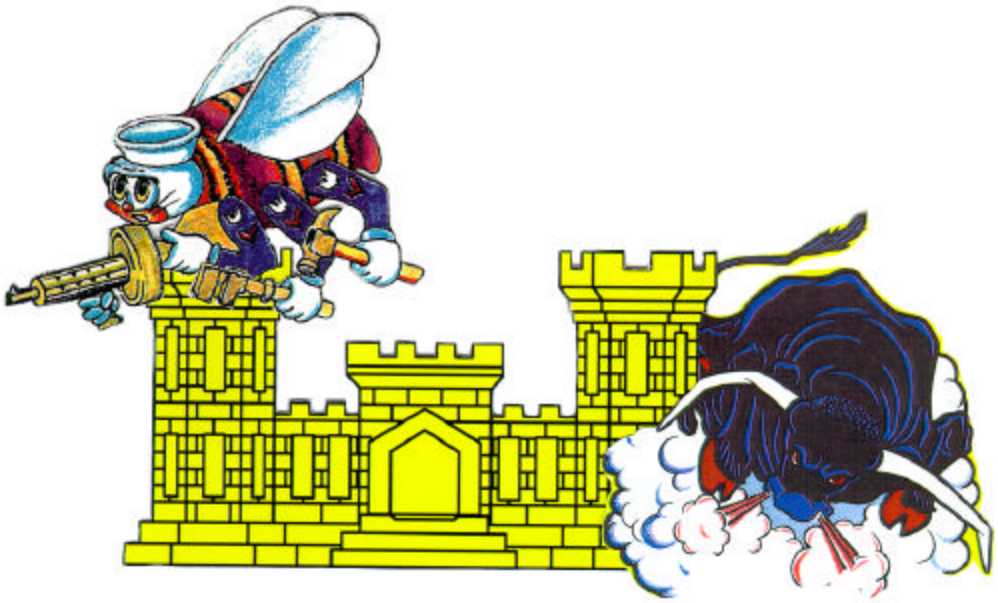
Review Questions
for
Carpentry

Question	Answer
1. The most commonly used framing materials are made of _____.	a. White pine b. Yellow pine c. Spruce and fir d. All of the above
2. Number 2 grade lumber _____.	a. Has knot holes b. Has limited number of insignificant defects c. Has checks, (Small cracks) d. Is not used for framing
3. Which grade of interior plywood is used for floor underlayment when a very good quality surface is required?	a. A-C b. C-C c. CDX d. All of the above
4. Which grade of plywood is primarily used for wall sheathing and roof decking, or when smooth surface is not important?	a. A-C b. C-C c. CDX d. All of the above
5. The most commonly used sizes of gypsum wallboard are _____.	a. 4 ft x 8 ft. b. 4 ft. x 12 ft. c. Both a and b
6. Which statement is true concerning choosing the correct nails?	a. Box nails are used for light framing b. Common nails are used for light framing c. Common nails are used for standard framing d. Both a and c
7. What are the differences between casing and finish nails?	a. Casing nails are used for securing chair rail b. Finish nails are used to secure door jambs c. Casing nails are lighter duty nails than finish nails d. Casing nails are used to secure door jambs while finish nails are used to install chair rail
8. What is the purpose of coatings on specialized nails?	a. To ease driving the nail in b. To give the nail extra holding power c. To prevent the nail from splitting the wood d. None of the above

CARPENTRY

Performance Checklist		
Step	**Yes**	**No**
1. Can trainee distinguish between the different types of structural lumber and their applications?		
2. Can the trainee distinguish between the different grades of structural lumber?		
3. Can the trainee distinguish between the different grades of plywood and their applications?		
4. Can the trainee know the basic types of drywall?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



IDENTIFY TYPE OF MATERIAL REQUIRED FOR:

MODULE 13 AFQTP UNIT 3

MASONRY (13.3.2.)

MASONRY

Task Training Guide

STS Reference Number/Title:	13.3.2. Masonry
Training References:	• AFMs 85-46, 85-59; NAVEDTRA 12520, 12521, Builders 3 and 2; Modern Masonry by Clois E. Kicklighter CDC 3E351 Set B, Volume 3
Prerequisites:	• Possess as a minimum, a 3E351 AFSC, and a basic knowledge of masonry materials
Equipment/Tools Required:	• N/A
Learning Objective:	• Trainee will be able to recognize the most common masonry materials and know which materials to use for a given application.
Samples of Behavior:	• Trainee will demonstrate a basic knowledge of masonry materials and be able to recognize various materials and know when a specific material is to be used.

MASONRY

Background: Portland cement is of course the most basic element of masonry materials. Not all cement is portland, but it is by far the most common. It is made of powdered limestone, shale, and clay. There are five basic types of portland cement, including:

Type I: General-purpose cement. This is used to make concrete in sidewalks, bridges, culverts, and masonry units such as concrete blocks. Reaches full strength in 28 days.

Type II: Generates less heat during hydration than Type I. Used for building large structures. Reaches full strength in 45 days.

Type III: High early strength concrete. Reaches full strength in 7 days or less. Used for cold weather. Not used in pours of less than 2 1/2 feet due to the danger of shrinking or cracking during the high heat produced during hydration.

Type IV: Slowest curing of all concrete. Used in massive concrete structures such as dams. Does not reach full strength for 90 days.

Type V: Sulfate resistant. Used where concrete comes in contact with soil or ground water with high sulfate content. Reaches full strength in 60 days.

Steel reinforcement. More commonly known as rebar, these reinforcements provide the necessary tensile strength to concrete. Their placement and design of rebar will be determined by the project engineer. Most rebar is not smooth, but rather deformed, to aid in its mechanical bonding to the concrete. Natural bonding takes place as adhesion and shrinkage of the hydration process takes place. Steel reinforcement is categorized as a bar number and a matching diameter in inches, as shown in Figure 1 below.

Bar #	Diameter
--	1/4 “(available only as smooth)
3	3/8 “
4	1/2 “
5	5/8 “
6	3/4 “
7	7/8 “
8	1 “
9	1 1/8 “
10	1 1/4 “
11	1 3/8 “

Figure 1, Standard Reinforcing Bar Sizes

Concrete blocks. Concrete blocks are the basic masonry unit. Blocks can be lightweight or heavy weight. Exterior and load bearing walls need to be constructed of the heavier type for two reasons: Support loads, and they are less porous and less likely to absorb water. The standard size of a full block is 7-5/8 x 7-5/8 x 15-5/8 inches. With the standard 3/8-inch mortar joint, it will measure 8 inches high and 16 inches long. There is a wide selection of block sizes, shapes, textures, and colors, as shown in Figure 2., below.

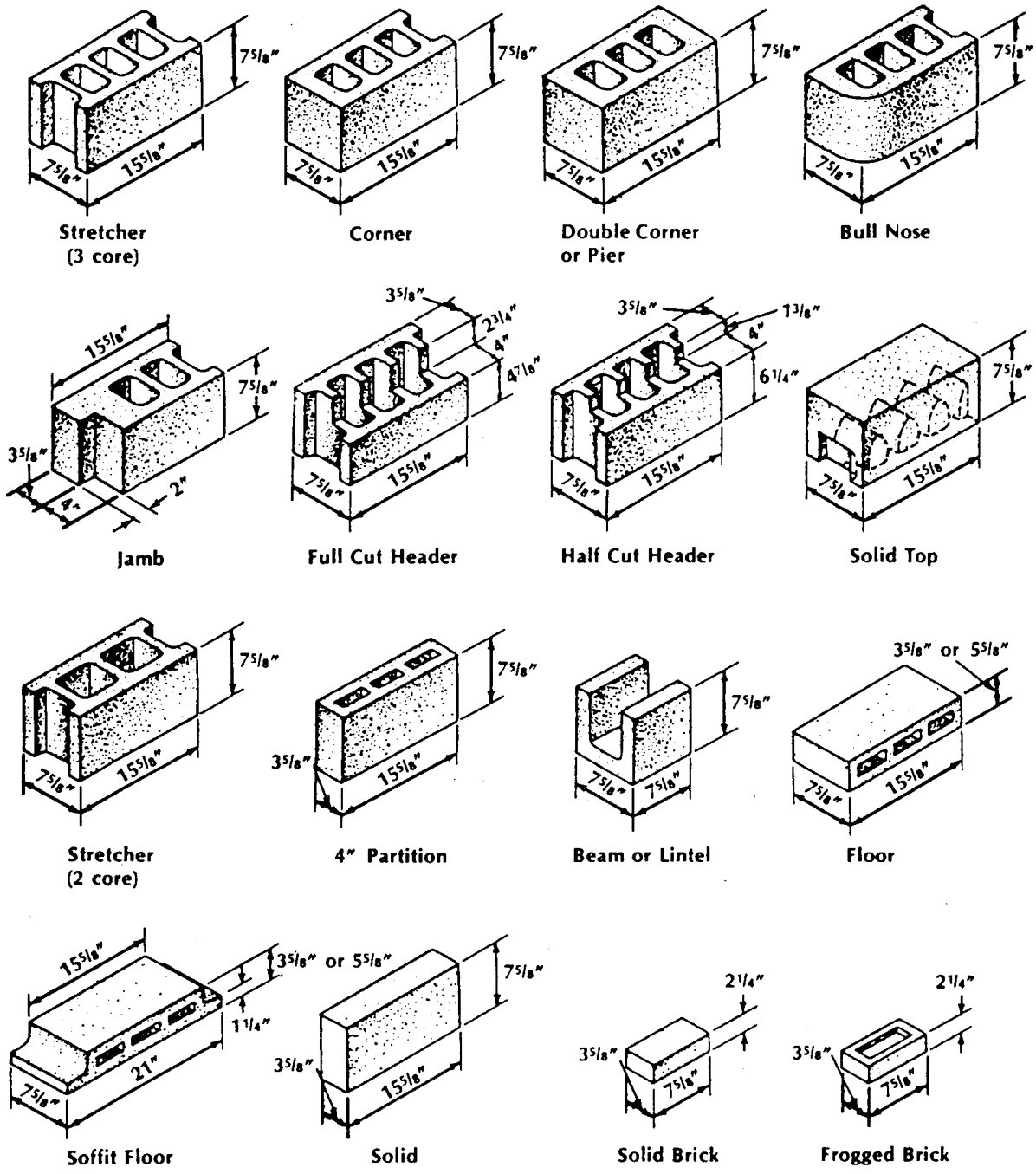


Figure 2, Standard Masonry Units

Concrete block reinforcement. This type will probably be specified in new block construction. Project engineers will determine what reinforcement is required at what locations and spacing. There are four basic types, including:

- **Steel reinforcement.** This type of reinforcement is normally tied to steel projecting through the pad and extends through the cells of the block into the bond beam. Typically all corners of the structure as well as both sides of door and window openings require reinforcement.

- **Tie bars.** These bars are used only at intersections of load bearing walls.

- **Metal lath or 1/4 inch galvanized hardware cloth.** These two are used to tie together non-load bearing walls.

- **Block bond.** Block bond resembles a ladder fabricated of hardware fabric used in concrete pad construction. It is placed in the mortar bed every 2 or 3 courses. They provide strength horizontally.

Brick. Brick types vary widely according to their intended purpose such as: building brick, firebrick, paving brick, or brick veneer. The two standard sizes for brick are 2-1/4 inches high x 3-3/4 inches wide x 8 inches long, and 2-1/4 x 3 inches wide x 8 inches long. The most commonly used types of building brick in the Air Force are the common, face, pressed, and firebrick.

- **Common bricks.** Common bricks are known by a wide variety of slang terms such as clinker, rough hard, well burned, soft, and stretcher. Hardness varies widely and their shape is slightly irregular. The best common brick is known as a stretcher. They have the most uniform size, hardness, and durability.

- **Face bricks.** These bricks are a higher grade than common brick. They have uniform hardness, strength, size, color, and texture.

- **Pressed brick.** Pressed brick may be of almost any type brick, except they are hardened by the dry press at the factory.

- **Fire brick.** These bricks are resistant to extreme heat due to special clays they are formed from. They are used in fireplaces, furnaces, and out door BBQ grills.

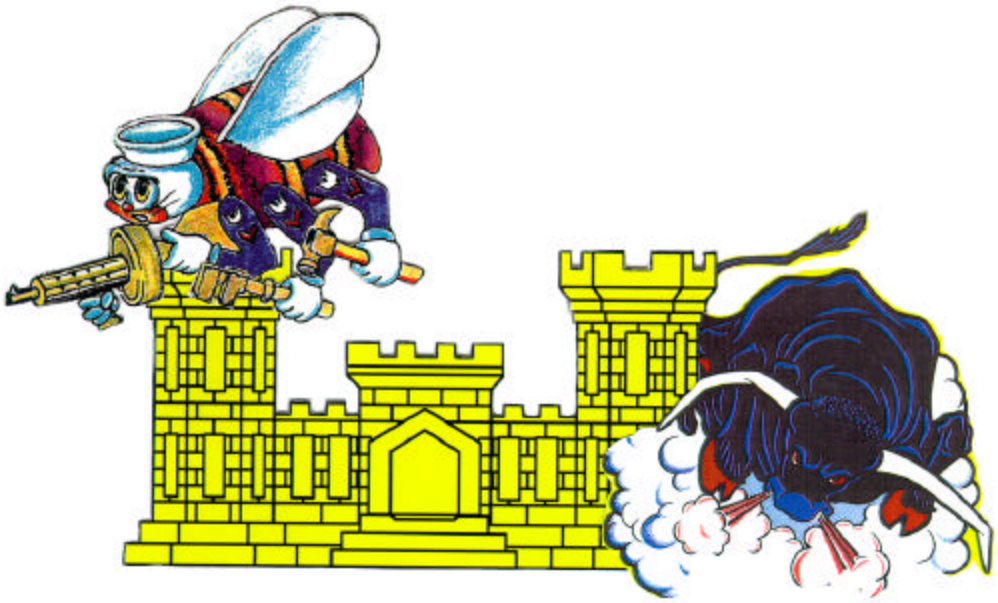
Review Questions
for
Masonry

Question	Answer
1. What type concrete produces low heat and reaches full strength in 45 days?	a. Type I b. Type II c. Type III d. Type IV
2. #5 steel reinforcement is what size (in inches)?	a. 1/2 b. 5/8 c. 3/4 d. 7/8
3. Lightweight block is used for non-load bearing walls.	a. True b. False
4. What is used to reinforce intersecting block load bearing walls?	a. Metal lath b. Galvanized hardware cloth c. Tiebars d. Block bond
5. Common brick is superior in quality to pressed brick.	a. True b. False

MASONRY

Performance Checklist		
Step	**Yes**	**No**
1. Can the trainee identify the different types of portland cement used to make concrete?		
2. Can the trainee state the different types of steel reinforcement used in concrete?		
3. Can the trainee state the most common types of concrete block and their applications?		
4. Can the trainee state the basic types of concrete block reinforcement?		
5. Can the trainee explain basic facts about the different types of brick?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



IDENTIFY TYPE OF MATERIAL REQUIRED FOR:

MODULE 13 AFQTP UNIT 3

METAL (13.3.4.)

METAL

Task Training Guide

STS Reference Number/Title:	13.3.4. Metal
Training References:	• 3E351 CDCs
Prerequisites:	• Possess as a minimum, a 3E351 AFSC
Equipment/Tools Required:	• N/A
Learning Objective:	• Trainee should be able to identify the type of material required for a metal job.
Samples of Behavior:	• Trainee should know the different types of materials required for a metal job.

METAL

Background: There are a vast number of sheet metal types on the market these days. We will discuss some common types, sizes and thicknesses.

- **Galvanized metal.** This is the most commonly used metal. This is what most of your ductwork is made out of. You can get it in 3 or 4-foot wide sheets that are 8 or 10 feet long or in rolls, depending on the thickness.

- **Aluminum.** Aluminum is another metal commonly used. It can be ordered in sheets or in rolls depending on the thickness. It can be used for signs and fabrication near salt water to avoid rusting.

- **Stainless steel.** This is a very hard steel that also comes in sheets or rolls. It is commonly used in kitchens or in hospitals where you need a non-corrosive metal.

- **Expanded metal.** This metal can be used for drain covers and many other jobs. It can be ordered in 4X10 sheets.

Table 1 shows the different shapes of metal commonly used, how they are normally measured, and also how you normally purchase these shapes.

Table 1, Common Shapes of Metals

SHAPES	LENGTH	HOW MEASURED	HOW PURCHASED
Sheets less than 1/4 in. thick	Up to 10 ft	Thickness X Width X Length	Foot or Piece
Plate more than 1/4 in. thick	Up to 20 ft	Thickness X Width X Length	Foot or Piece
Rod	12 to 20 ft	Diameter	Foot or Piece
Angle iron	Lengths up to 40 ft.	Leg Length X Leg Length X Thickness of legs	Foot or Piece
Channel	Lengths up to 40 ft.	Depth X Web thickness X Flange Weight	Foot or piece

These are just a few of the metals you will come in contact with during many of your jobs. By no means are these all of the types you will probably encounter throughout your career. It will depend on the specific job and the specifications for that job.

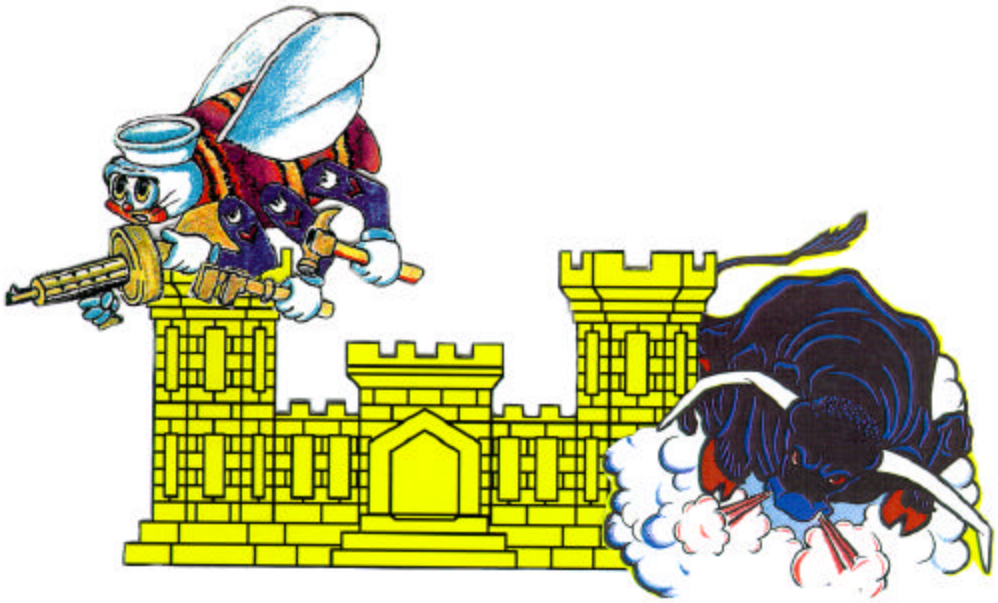
Review Questions
for
Metal

Question	Answer
1. Most metal comes in rolls or sheet.	a. True b. False
2. Metal ordered in rolls depends on the thickness of the metal.	a. True b. False
3. Metal rods can be ordered in pieces up to 40 foot.	a. True b. False

METAL

Performance Checklist		
Step	**Yes**	**No**
1. Was the trainee able to identify the different types of metal?		
2. Was the trainee able to identify the different thickness of metal?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



ESTABLISH QUANTITY OF MATERIAL REQUIRED FOR:

MODULE 13 AFQTP UNIT 4

CARPENTRY (13.4.1.)

CARPENTRY

Task Training Guide

STS Reference Number/Title:	13.4.1. Carpentry
Training References:	• NAVEDTRA 12520, 12521, Builders 3 and 2, Vol. 1 & 2; Modern Carpentry, by R.T. Miller, CDC 3E351, Vol. 2B, Unit 2, Chapter 2.
Prerequisites:	• Study CDC 3E351 Vol. 2B, Unit 2-2. • Possess as a minimum, a 3E351AFSC.
Equipment/Tools Required:	• Tape measure, calculator
Learning Objective:	• Trainee will be able to calculate the amount of materials required for basic carpentry projects.
Samples of Behavior:	• Trainee will demonstrate a basic knowledge of formulas, waste factors, etc., for estimating materials for common carpentry projects.

CARPENTRY

Background: Planning projects is not exclusive to the Planning Section of CE. Chances are you will be asked to plan projects that range from a simple job order to a fairly complex work order. Even though a project is planned by a planner, it is still the responsibility of the craftsman to check all materials received, to ensure the proper quantities are on hand. This will help prevent job stoppages that result in costly lost time. When estimating materials, you need to be reasonably accurate. Excessive material wastes government money, while material shortages cause job stoppages.

Establish Quantity of Material Required for Carpentry:

Trainees should familiarize themselves with the basic formulas for estimating carpentry materials. These include the following:

- **Estimating ceiling area.** Simply multiply the room's length by its width.

  Formula: $\frac{Length \times Width}{32} + 5\%$

- **Estimating ceiling tile.** Simply multiply the room width by its length to determine the area. Next, divide the square footage by the square footage of one tile. One 2' x 2' and one 2' x 4' tile would be 4 square feet or 8 square feet respectively.

  Formula: $\frac{Width \times Length}{4 \text{ or } 8} + 5\%$

- **Estimating floor tile.** Start by finding the area to be covered by multiplying the room's width by length. For 12" floor tile, the total square footage to be covered will equal the number of tile required. Then add 10% for waste. For 9" floor tile, multiply the total square footage to be covered by 1.77. This formula plus 10 % allowance for waste will give you the total number of tiles required.

  12-inch tile: Width X Length X 1 + 10%
  9-inch tile: Width X Length X 1.77 + 10%

- **Estimating board feet.** Lumber is procured by the Air Force in measurements of board feet. When calculating board feet, remember to use the nominal measurement, not the actual measurement. Multiply the width by the thickness (in inches), by the length in feet. Divide that sum by 12 to get the total number of board feet.

$$\frac{\textit{Thickness X Width X Length}}{12} + 5\%$$

- **Estimating wall studs.** To determine the number of wall studs required, spaced 16 inches on center (O/C), find the total length of all exterior walls and interior partition walls. Next, multiply that by 3/4 (.75). Then add one additional stud. For any corner post, partition, or opening (such as door or window) add two more studs. When walls are specified with 24 inch on center, use the same formula as above, except multiply by 1/2 (.50) instead of 3/4.

16 Inches O/C.: (Length of exterior + interior walls) X .75 + 1
24 Inches O/C.: (Length of exterior + interior walls) X .50 + 1

- **Estimating plates.** Calculate the total number of linear feet for all exterior and interior walls. Multiply the total by 3, (1 sole plate and a double top plate), then add 10%.

(Length of exterior + interior walls) X 3

- **Estimating roofing felt.** Measure the roof's length and width and then multiply to get the square footage. (If parapet walls are used, include their square footage also). Deduct the square footage of any roof opening only if it is over 100 sq. ft. Divide the total square footage by 100 to get the total number of squares. One square is 100 square feet. Roofing felt normally comes in a 200 square foot roll, (2 squares). Take the total square footage to be covered and divide it by 200 to get the total number of rolls required.

$$\frac{\textit{(Length X Width + Parapets) minus roof openings over 100 sq. ft.}}{200}$$

- **Estimating Built-Up Roofs.** Determine the total square footage by the same method used above. Multiply that by the number of plies specified. To estimate asphalt or bitumen requirements consult with manufacturers specifications**.**

[(Length X Width + Parapets) minus roof openings over 100 sq. ft.] X # of plies specified.

- **Estimating roof shingles.** Find the total square footage to be covered. This of course includes all cornice and eave overhangs. For a common gable roof measure the width of one side by the length and multiply that sum by two, (two sides of the roof).

  To estimate roof square footage from the ground requires considerably more calculations. Using this method multiply the structures length by its width. Add eave and cornice overhangs on both sides. This is the area of a flat roof. Next an allowance must be added for the pitch of the roof. Use the following formulas to determine the allowance:

ROOF PITCH	ALLOWANCE
3 / 12	Add 3 %
4 / 12	Add 5 1/2 %
5 / 12	Add 8 1/2 %
6 / 12	Add 12 %
8 / 12	Add 20 %

Divide the total square footage by 100 (1 square), then add 10 % for waste. This will give you the total number of squares required. It is obviously more difficult to calculate by starting with the structures base measurements. Remember, it takes 3 bundles of shingles to make 1 square.

From the roof: $\frac{(\textit{One side of the Roof Width X Length}) \textit{ X } 2}{100} \textit{ + 10\%}$

From the ground: $\frac{\textit{Buildings base length + eave and cornice overhang X Width + pitch allow.}}{100} \textit{ + 10 \%}$

NOTE:
This AFQTP covers only the major material requirements for the tasks listed above. Don't forget all other essential materials to finish the project. Consult applicable good ITRO Training References to find all material requirements.

Review Questions
for
Carpentry

Question	Answer
1. When estimating the amount of drywall required to cover the entire room the first step is to _____.	a. Determine what size sheets will be used b. Measure the door and window openings c. Add 5 % for waste d. Calculate wall and ceiling square footage
2. Given a 16 x 32 ft. room, how many 2" x 2" drop ceiling tiles are required?	a. 115 b. 118 c. 125 d. 128
3. Which is the correct formula for estimating 9" floor tile?	a. Room square footage x 1.77 + 10% b. Room square footage x 1 + 10 % c. Room square footage x 1.77 + 5 % d. Room square footage x 1 + 5 %
4. What is the formula for estimating board feet?	a. Multiply the width by the thickness by the length in inches divided by 27 b. Multiply the width by the thickness in inches by the length in feet divided by 27 c. Multiply the width by the thickness in inches by the length in feet divided by 12 d. Multiply the width by the thickness by the length in inches divided by 12
5. How many wall studs, 16" on center are required to build a 24-foot partition wall with a door?	a. 18 b. 19 c. 21 d. 22
6. How many linear feet of top and sole plates are required to construct a 24-foot partition wall with a door?	a. 24 b. 48 c. 72 d. 96
7. To cover a 1200 sq. ft. roof with a 5 ft. sq. opening, how many rolls of felt underlayment does it require?	a. 5 b. 6 c. 12 d. 36
8. The formula for estimating material requirements for a built up roof is: Total area + parapets minus roof openings over 100 sq. ft. X _____.	a. Number of plies specified b. Type of plies specified c. Both a and b d. None of the above

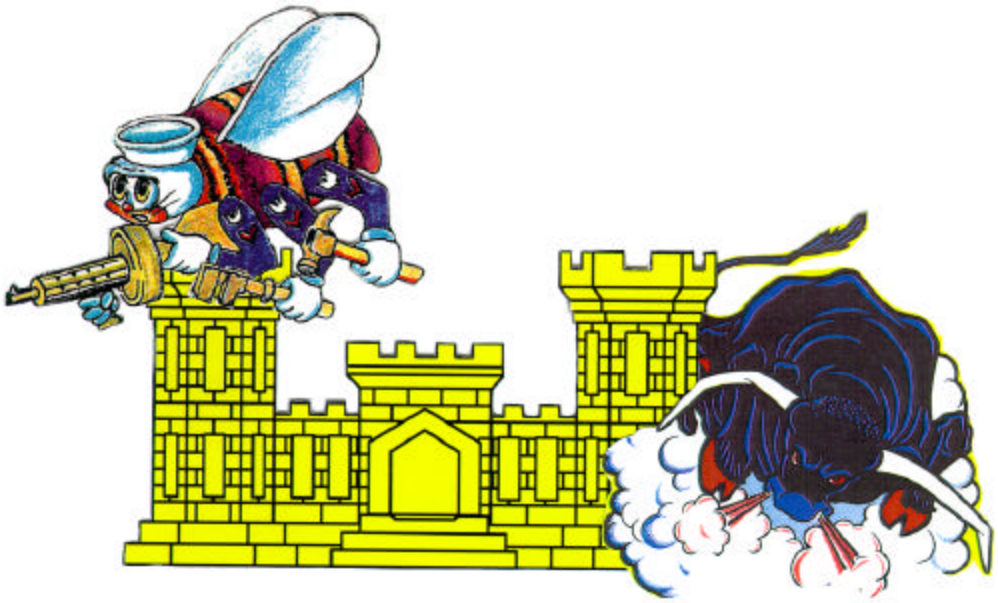
Review Questions
for
Carpentry

Question	Answer
9. Manufacturer specifications must be consulted to determine asphalt or bitumen requirements.	a. True b. False
10. How many squares of shingles are required to cover a 2400 sq. ft. roof, excluding waste? And also, how many bundles of shingles excluding the waste allowance?	a. 15 squares / 45 bundles b. 18 squares / 54 bundles c. 20 squares / 60 bundles d. 24 squares/ 80 bundles

CARPENTRY

Performance Checklist		
Step	**Yes**	**No**
1. Can the trainee calculate the basic formulas for estimating carpentry materials correctly?		
2. Can the trainee estimate shingles for roof pitches and the allowance, when given the appropriate formula?		
3. Can trainee correctly estimate material requirements for a built-up roof?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



ESTABLISH QUANTITY OF MATERIAL REQUIRED FOR:

MODULE 13 AFQTP UNIT 4

MASONRY (13.4.2.)

MASONRY

Task Training Guide

STS Reference Number/Title:	13.4.2. Masonry
Training References:	• NAVEDTRA 12520, 12521, Builders 3 and 2, Vol. 1 & 2; Modern Masonry by Clois E. Kicklighter, CDCs 3E351, Vol. 2B, Unit 2, Chapter 2.
Prerequisites:	• Study CDC 3E351 Vol. 2B, Unit 2-2. • Possess as a minimum, a 3E351 AFSC
Equipment/Tools Required:	• Tape measure, calculator
Learning Objective:	• Trainee will be able to calculate the amount of materials required for basic masonry projects
Samples of Behavior:	• Trainee will demonstrate a basic knowledge of formulas, waste factors, etc., for estimating materials for common masonry projects.

MASONRY

Background: Your Supervisor may task you with calculating how much concrete is required to complete your job. To be proficient, you must be able to take measurements and perform some basic mathematical calculations.

You can't slight this step because a mistake here could mean either insufficient materials, or you may have too much. For most jobs you should add 5% to calculate for waste and spillage.

One critical point to remember here is that you must keep your units consistent throughout the entire process. In other words, all measurements must be converted into feet when determining concrete quantities.

- **Estimating Concrete.** Estimating concrete is a fairly simple process. First, determine the area (*l x w)* in ft. to be covered. Multiply that by the desired thickness**.** Thickness must be in the decimal equivalent. Once those dimensions have been determined, divide their product by 27 (because there are 27 cubic feet in a cubic yard of concrete). Thus, the formula for estimating concrete is:

  Formula: $\frac{\textit{Length (ft) x Width (ft) x Thickness (ft)}}{27}$

  Example: $\frac{14 \times 17 \times 4\text{"}(=.33)}{27}$ *14 x 17 = 238 x .33=78.54 sq. ft*

  $\frac{78.54}{27}$ *= 2.908 cu yd. + 5% for waste*

  Therefore you would order 3 cubic yards of concrete

Concrete Thickness	÷ 12	=	Decimal Equivalent
4 inches	÷ 12	=	.33
6 inches	÷ 12	=	.50
8 inches	÷ 12	=	.75

For more understanding of how calculations are done, see Figure 1 on the following page. It's a useful chart for calculating concrete.

- **Estimating Brick:** First determine the dimensions of the proposed walls to be built. Then multiply the width x height, this is the total area. Including a 3/8" mortar, it takes 6.7 bricks to cover one square foot. By figuring 7 bricks per square foot, you will have a built in allowance for cut pieces and breakage.

  (width X height) X 7

- **Estimating Concrete blocks.** As with brick, first determine the area to be covered. Then multiply the area by .889. (One 8" x 16" block covers just under one square foot). Add an additional 10% for cut pieces and breakage.

  (width X height) X .889 + 10%

CONCRETE AND ASPHALT CALCULATIONS

Base Course: L x W X D x 100 / 2000 + 5 %= Tons.
Concrete: L x W x D / 27 + 5%= Cu. Yds.
BC (radius): 3.14 x R square x D x 100 / 2000 + 5%= Tons.
Concrete (radius): 3.14 x R square x D / 27 + 5% = Cu. Yds.
Asphalt (Hot): L x W x D x 140 / 2000 + 5%= Tons.
Asphalt (Cold): L x W x D x 90 / 2000 + 5 % =Tons.
Asphalt (Radius): 3.14 x R square x 140 (or 90) / 2000 + 5% = Tons.
Emulsion: L x W / 9 x AR = Gals.
AR= Application Rate.

APPLICATION RATES

1/2" = .04165	**7" = .5833**
1" = .0833	**8" = .6667**
2" = .1667	**9" = .75**
3" = .25	**10" = .8333**
4" = .33	**11" = .9167**
5" = .4167	**12" = 1**
6" = .5	

Cubic Yards x .765 = Cubic Meters
Cubic Meters x 1.3 = Cubic Yards

CONCRETE AND ASPHALT CALCULATIONS

Base Course: L x W X D x 100 / 2000 + 5 %= Tons.
Concrete: L x W x D / 27 + 5%= Cu. Yds.
BC (radius): 3.14 x R square x D x 100 / 2000 + 5%= Tons.
Concrete (radius): 3.14 x R square x D / 27 + 5% = Cu. Yds.
Asphalt (Hot): L x W x D x 140 / 2000 + 5%= Tons.
Asphalt (Cold): L x W x D x 90 / 2000 + 5 % =Tons.
Asphalt (Radius): 3.14 x R square x 140 (or 90) / 2000 + 5% = Tons.
Emulsion: L x W / 9 x AR = Gals.
AR= Application Rate.

APPLICATION RATES

Prime Coat = .1 - .25	**Tack Coat = .05- .15**
Fog Seal = .1 - .2	**Single Surface Treatment = .1 - .5**
1/2" = .04165	**7" = .5833**
1" = .0833	**8" = .6667**
2" = .1667	**9" = .75**
3" = .25	**10" = .8333**
4" = .33	**11" = .9167**
5" = .4167	**12" = 1**
6" = .5	

Cubic Yards x .765 = Cubic Meters
Cubic Meters x 1.3 = Cubic Yards

Figure 1, Concrete and Asphalt Calculation/Application Chart

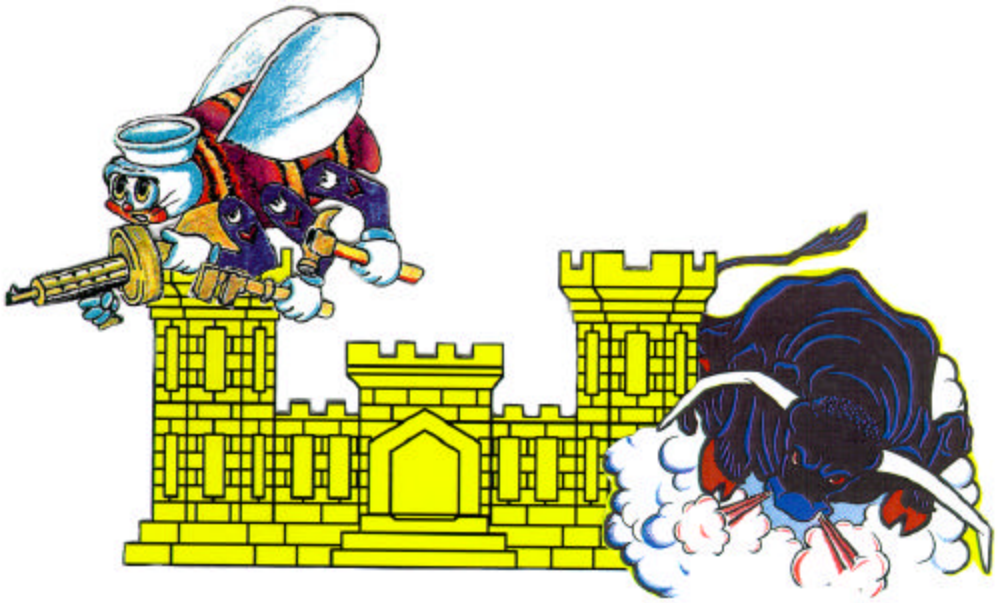
Review Questions
for
Masonry

Question	Answer
1. How many cubic yards of concrete, including the waste allowance, are required for a 12'x 12' x 4" pad? Round off to the next higher whole number.	a. 22 cubic yards b. 23 cubic yards c. 2 cubic yards d. 3 cubic yards
2. What is the waste allowance for concrete?	a. 2% b. 5% c. 7% d. 10%
3. Including waste, how many bricks are needed to build a single thickness 12 ft. x 22 ft. wall?	a. 1848 b. 1852 c. 1338 d. 1342
4. What is the formula for estimating concrete blocks?	a. (Width x Height) x 7 b. (Width x Height) divided by 7 c. (Width x Height) x .889 + 10% d. (Width x Height) divided by .889 + 10%
5. Add 5% for breakage and cut pieces when estimating concrete block.	a. True b. False

MASONRY

Performance Checklist		
Step	**Yes**	**No**
1. Can trainee estimate cubic yards of concrete using the formula?		
2. Can the trainee calculate fractions into decimals?		
3. Can trainee estimate brick requirements using the formula?		
4. Can trainee estimate concrete block requirements using the formula?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer



ESTABLISH QUANTITY OF MATERIAL REQUIRED FOR:

MODULE 13 AFQTP UNIT 4

METAL (13.4.4.)

METAL

Task Training Guide

STS Reference Number/Title:	13.4.4. Metal
Training References:	• 3E351 CDCs
Prerequisites:	• Possess as a minimum, a 3E351 AFSC.
Equipment/Tools Required:	• Tape measure
Learning Objective:	• Trainee should be able to plan the material list with the right amount of material for the job.
Samples of Behavior:	• Trainee will be able to successfully gather and order the correct materials for a metals job.

METAL

Background: Ordering the right amount of materials is a big part in the overall construction job. If you don't have enough materials you lose time, and if you have too much materials you waste money. This leads to poor planning so you must know what to do when building the material list for the metal job.

When estimating a duct job, the first thing you need to do is get all the measurements for the ducts you will be laying out. The easy way to do this is make a scale drawing of the job you will be doing.

After you have determined what the measurements for the ducts should be, multiply the width by 2, and the height by 2, and that should give you the overall measurements for your duct. Remember to add for your seams. A sheet of metal comes in 3 ft and 4 ft widths and can be 8 ft to 10 ft in length. Therefore you have to take the measurements of your duct to see which sheet will be right on for the job with the smallest amount of waste. You must plan for your hangers, drives and S-slips as well. You might be able to get some of these from the extra metal on the sheets used for the duct work, but if not, you will need to order more metal.

The size of the supply and return registers are on the blueprints. Always make sure that the right size is ordered to insure proper airflow is achieved in the building.

After the material list has been built, double-check the list once more, using the blueprints to ensure that all of the materials have been covered. Once you've finished the list, you're ready to order the materials.

Review Questions
for
Metal

Question	Answer
1. If the right amount of materials is not ordered it will waste time and money.	a. True b. False
2. The first thing you need to do when estimating a duct job is to get all the measurements of the duct you are going to layout?	a. True b. False
3. What is the manufactured size of a sheet of metal?	a. 4x 8 b. 4x 10 c. 3x 8 d. 3x 10 e. All the above

METAL

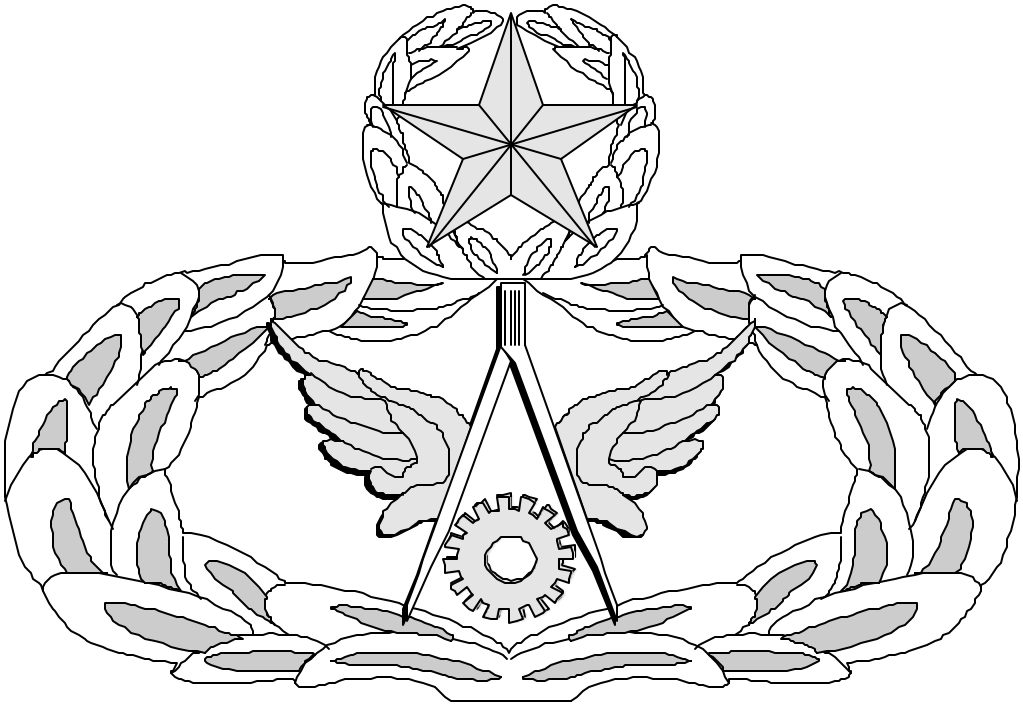
Performance Checklist		
Step	**Yes**	**No**
1. Was the trainee able to plan all the steps to get the material list?		
2. Did the trainee use the blueprints to get the measurement for all the ductwork?		
3. Did the trainee double check the material list before ordering the materials?		
4. Did the trainee take into count for all his drives and S-slips?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Air Force Civil Engineer

QUALIFICATION TRAINING PACKAGE (QTP)

REVIEW ANSWER KEY



For

STRUCTURAL

(3E3X1)

MODULE 13

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CARPENTRY

(3E3X1-13.2.1.)

Question	Answer
1. Which plan shows boundaries, existing utilities, landmarks, and the location of the proposed structure?	d. Site plan
2. Which plan is the primary plan from which the interior walls are laid out?	a. Floor plan
3. Specifications provide _____.	d. All of the above
4. Schedules provide _____.	c. Listing of doors and windows to be used
5. Detail drawings show construction features too small to be seen on other drawings.	a. True
6. If specifications and construction drawings conflict _____.	b. Specifications take precedence

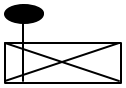
MASONRY

(3E3X1-13.2.2.)

Question	Answer
1. Which plan is the primary plan from which the footers are laid out?	c. Foundation plan
2. Which plan is the primary plan from which the concrete block walls are laid out?	a. Floor plan
3. Specifications provide _____.	d. all of the above
4. Schedules provide _____.	c. Listing of doors and windows to be used
5. Detail drawings show _____.	b. Steel reinforcement placement in concrete block cores
6. Where would you find information on what strength concrete to fill the bond beam with?	b. Specifications

METAL

(3E3X1-13.2.3.)

Question	Answer
1. Construction drawings provide a complete description of all phases of the construction process.	a. True
 2. This is the symbol for _____.	d. Damper deflecting up
3. It is not necessary to consult the construction drawings while performing a metals job.	b. False
4. After all ductwork is installed, install _____.	b. return air vents

CARPENTRY

(3E3X1-13.3.1.)

Question	Answer
1. The most commonly used framing materials are made of _____.	d. All of the above
2. Number 2 grade lumber _____.	b. Has limited number of insignificant defects
3. Which grade of interior plywood is used for floor underlayment when a very good quality surface is required?	a. A-C
4. Which grade of plywood is primarily used for wall sheathing and roof decking, or when smooth surface is not important?	c. CDX
5. The most commonly used sizes of gypsum wallboard are _____.	c. Both a and b
6. Which statement is true concerning choosing the correct nails?	d. Both a and c
7. What are the differences between casing and finish nails?	d. Casing nails are used to secure doorjambs while finish nails are used to install chair rail.
8. What is the purpose of coatings on specialized nails?	b. To give the nail extra holding power

MASONRY

(3E3X1-13.3.2.)

Question	Answer
1. What type concrete produces low heat and reaches full strength in 45 days?	b. Type II
2. #5 steel reinforcement is what size (in inches)?	b. 5/8
3. Lightweight block is used for non-load bearing walls.	a. True
4. What is used to reinforce intersecting block load bearing walls?	c. Tie bars
5. Common brick is superior in quality to pressed brick.	b. False

METAL

(3E3X1-13.3.4.)

Question	Answer
1. Most metal comes in rolls or sheet.	a. True
2. Metal ordered in rolls depends on the thickness of the metal.	a. True
3. Metal rods can be ordered in pieces up to 40 foot.	b. False

CARPENTRY

(3E3X1-13.4.1.)

Question	Answer
1. When estimating the amount of drywall required to cover the entire room the first step is to _____.	d. Calculate wall and ceiling square footage
2. Given a 16 x 32 ft. room, how many 2" x 2" drop ceiling tiles are required?	d. 128
3. Which is the correct formula for estimating 9" floor tile?	a. Room square footage x 1.77 + 10%
4. What is the formula for estimating board feet?	c. Multiply the width by the thickness in inches by the length in feet divided by 12
5. How many wall studs are required to build a 24-foot partition wall with a door?	c. 21
6. How many linear feet of top and sole plates are required to construct a 24-foot partition wall with a door?	c. 72
7. To cover a 1200 sq. ft. roof with a 5 ft. sq. opening, how many rolls of felt underlayment does it require?	b. 6
8. The formula for estimating material requirements for a built up roof is: Total area + parapets minus roof openings over 100 sq. ft. X _____.	a. Number of plies specified
9. Manufacturer specifications must be consulted to determine asphalt or bitumen requirements.	a. True
10. How many squares of shingles are required to cover a 2400 sq. ft. roof, excluding waste? And also, how many bundles of shingles excluding the waste allowance?	d. 24 squares/ 80 bundles

MASONRY

(3E3X1-13.4.2.)

Question	Answer
1. How many cubic yards of concrete, including the waste allowance, are required for a 12'x 12' x 4" pad? Round off to the next higher whole number.	c. 2 cubic yards
2. What is the waste allowance for concrete?	b. 5%
3. Including waste, how many bricks are needed to build a single thickness 12 ft. x 22 ft. wall?	a. 1848
4. What is the formula for estimating concrete blocks?	c. Width x Height x .889 + 10%
5. Add 5% for breakage and cut pieces when estimating concrete block.	b. False

METAL

(3E3X1-13.4.4.)

Question	Answer
1. If the right amount of materials is not ordered it will waste time and money.	a. True
2. The first thing you need to do when estimating a duct job is to get all the measurements of the duct you are going to layout?	a. True
3. What is the factory-manufactured size of a sheet of metal?	e. All of the above